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Infrared Detections of Satellites with IRAS

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LEXINGTON, MASSACHUSETTS

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This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

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ABSTRACT

The sky survey made by the infrared astronomical satellite (IRAS) in 1983 included observations of artificial earth satellites. The data base (with celestial objects removed) was correlated with the NORAD space catalogue to identify 452 satellites in orbit above the IRAS 900-km altitude. The flux density in three of the four wavelength bands has been analyzed to determine the temperature, emissivity, and absorptivity of the identified resident space objects.

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1. INTRODUCTION

Optical observations of artificial earth satellites have been made since the launch of Sputnik. Early measurements made using reflected visible light [1] were for information about the satellite position. Later, photometric observations were made to investigate properties of the satellite. Initially, signature data were obtained in the form of a time series or light curve. Later, calibrated photometric observations were used to discuss the reflective properties, such as reflectivity, and configuration of satellites [2]. Observations of the self-emitted IR radiation from satellites were also obtained. IR data are complementary to the visible band and UV data and can provide information about the absorptivity and emissivity of satellite materials. These ground-based observations were frustrated by large and variable atmospheric absorption [3] in addition to sensor calibration problems. Recently, high-quality ground-based IR satellite observations have been made [3].

The infrared astronomical satellite (IRAS) was launched in 1983 to perform an all-sky survey of the IR portion of the spectrum. While stellar objects—stars, nebulae, comets, and asteroids—were the primary objects of interest, IRAS also observed satellites and space debris. A number of attempts have been made to extract these data and demonstrate that IRAS data can be used to characterize IR emission of orbital debris. De Jong and Wesselius [4] and Anz-Meador et al. [5] used unprocessed IRAS detector data to search for debris. These studies found a few moving sources from searching only a few days of the mission data. Dow [6,29] used objects found in the Sky Brightness Images over the entire IRAS mission. All studies concluded that IRAS had the capability to observe quite small debris—Anz-Meador claimed sizes down to 1 mm—but none systematically attempted to isolate data on known satellites.

The Astronomical Group at Groningen reprocessed all the raw IRAS data tapes with the objective of finding all satellite and debris detections [4,7,8]. This effort produced a debris data base containing more than 190,000 detections. As a first step in analyzing this data base, we have concentrated on the catalogue of known satellites in 1983. By correlating positions in the debris data base with the known satellite catalogue, we have extracted the true satellite detections and been able to discuss the associated radiometric data. This analysis is the subject of this report.

The IRAS satellite made many observations of artificial earth satellites. Processing for astronomical objects (stars, planets, comets, and asteroids), Beichman [9] eliminated all satellite and debris data. The Astronomical Group at Groningen reprocessed all the raw IRAS data tapes. They abandoned the original approach of hours, days, and weeks confirmation, as this method was intended to eliminate observations of objects that did not reappear at the same place in the sky—just those objects of interest here. They established a method that examined each detection for multiple detector "hits" that were consistent in timing of their passage across the focal plane. The approach was very permissive, having wide bounds for accepting a plausible detection. The final catalogue contained more than 190,000 detections. The flux values were limited to those greater than 0.1 Jy ($W/m^2/Hz$). Also, they did not consider data from the 100-μ band. This data base was provided to Lincoln Laboratory. Consideration was limited to those detections with a signal-to-noise ratio (SNR) greater than about three: a data base of about 136,000 detections.

2. IRAS INSTRUMENT

The IRAS operated from March 1983 until cryogen depletion in November 1983. IRAS was in a sun-synchronous orbit with the orbital plane (800-km altitude, 99.2° inclination) nearly perpendicular to the sun line, as illustrated in Figure 1. The telescope was always pointed away from the earth center, i.e., toward the zenith. The spacecraft attitude control system allowed pole-to-pole scans in ecliptic longitude from 60° to 120°; most scans were taken between 84° and 96°.

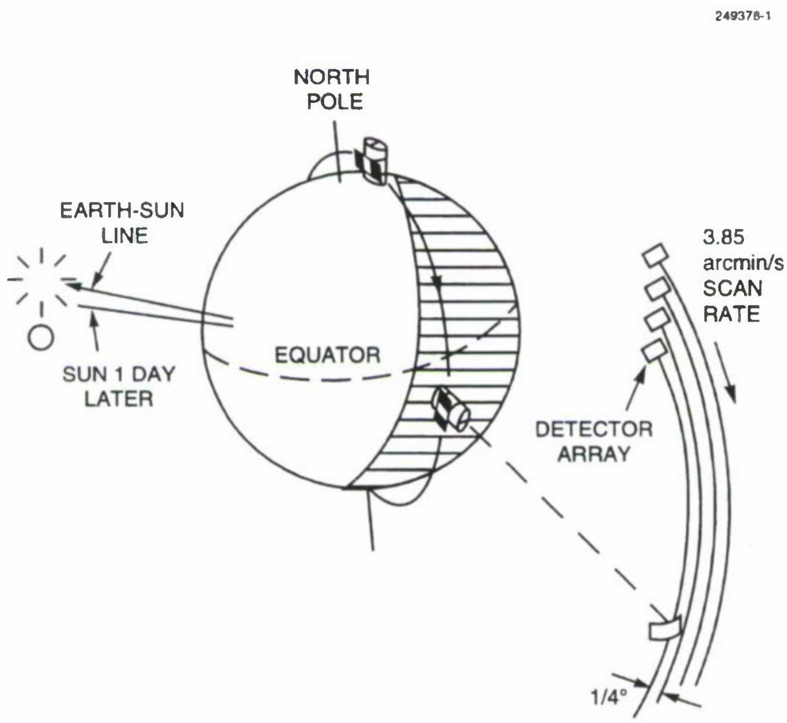


Figure 1. IRAS orbit geometry.

The IRAS detectors covered four long wavelength IR bands having flux density reporting values of 12, 25, 60, and 100 μ. These correspond to peak flux densities of 242, 116, 48, and 29 K. The peak wavelength for the nominal free-space temperature of 300 K, $T = 2898/\lambda$, is 9.66 μ near the lower cutoff of the 12-μ band.

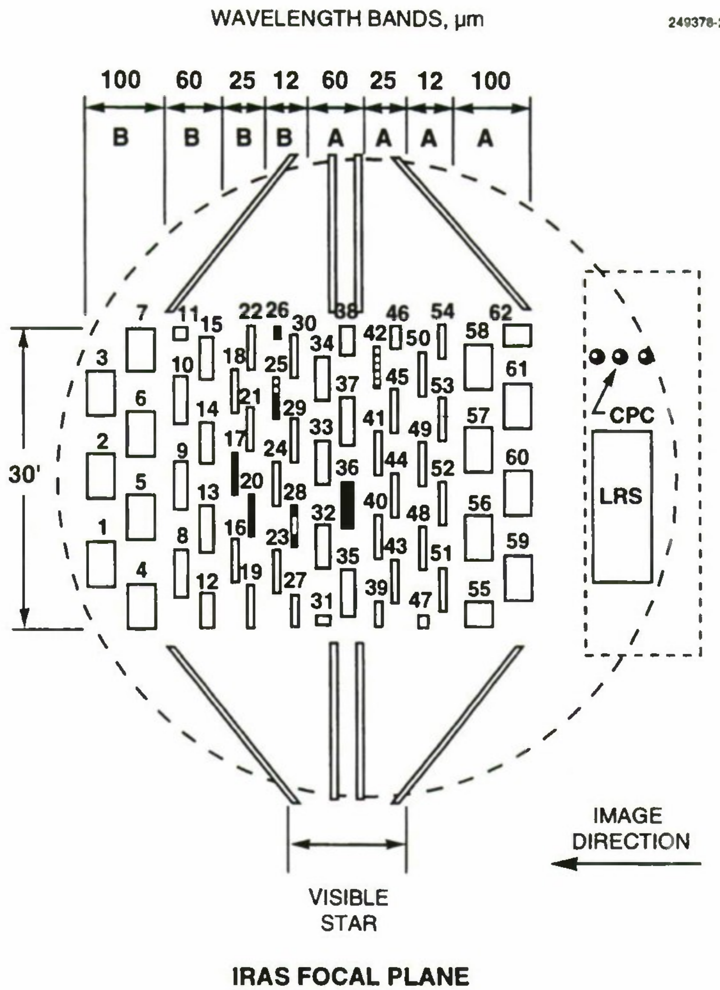


Figure 2. IRAS focal plane.

The IRAS detectors in each of the bands were arranged on a 30-arcmin focal plane, as illustrated in Figure 2. A star or satellite crossing the scanning focal plane would traverse a number of detectors in several wavebands. Each of the 59 detectors had a different response function, as tabulated in Beichmann, Table II.C.5, page II-18. The detectors had a rectangular shape: 0.75 $\times$ 4.5 arcmin for the 12- and 25-μ detectors and 3 $\times$ 5 arcmin for the 60- and 100-μ detectors. As shown in Figure 2, the spacecraft attitude was such that in the scan direction, motion of fixed stellar sources or satellites across the focal plane was along the short detector axis. Consequently, the positional accuracy in the along-scan direction was much better.

The camera electronics used a 6-Hz lowpass filter to "despike" the data. The detectors were sampled at 16 Hz. The scanning speed, determined by the IRAS orbital motion, was 3.85 arcmin/sec. Therefore, a stationary source traversed the 0.75-arcmin detector in 0.19 sec, giving about three samples for a detection. Consequently, all objects (stellar sources, solar system objects, satellites, and debris) have very similar detections. This is illustrated in Figure 3 (from Wesselius et al.). Therefore, the response function is not a suitable vehicle for identifying satellites and debris.

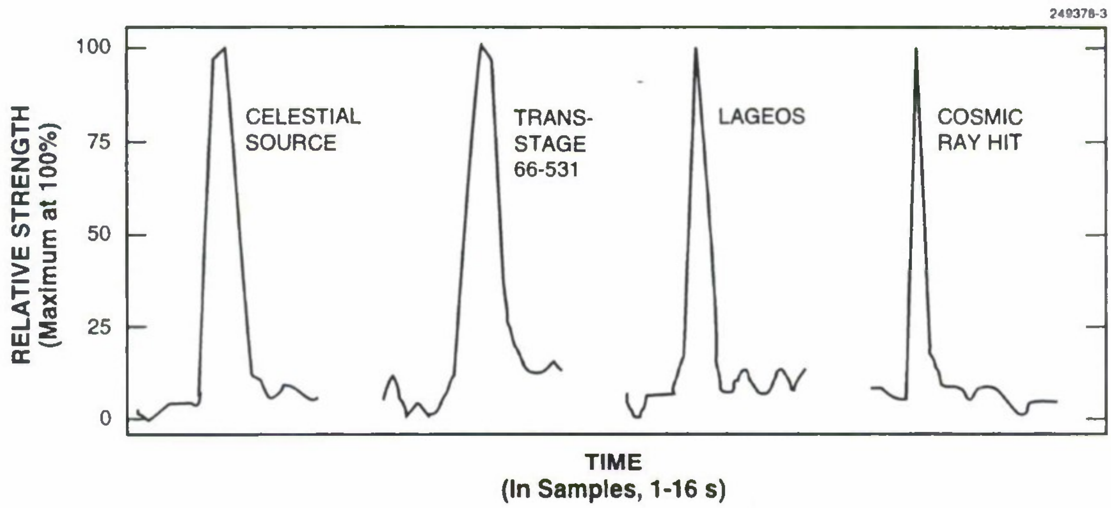
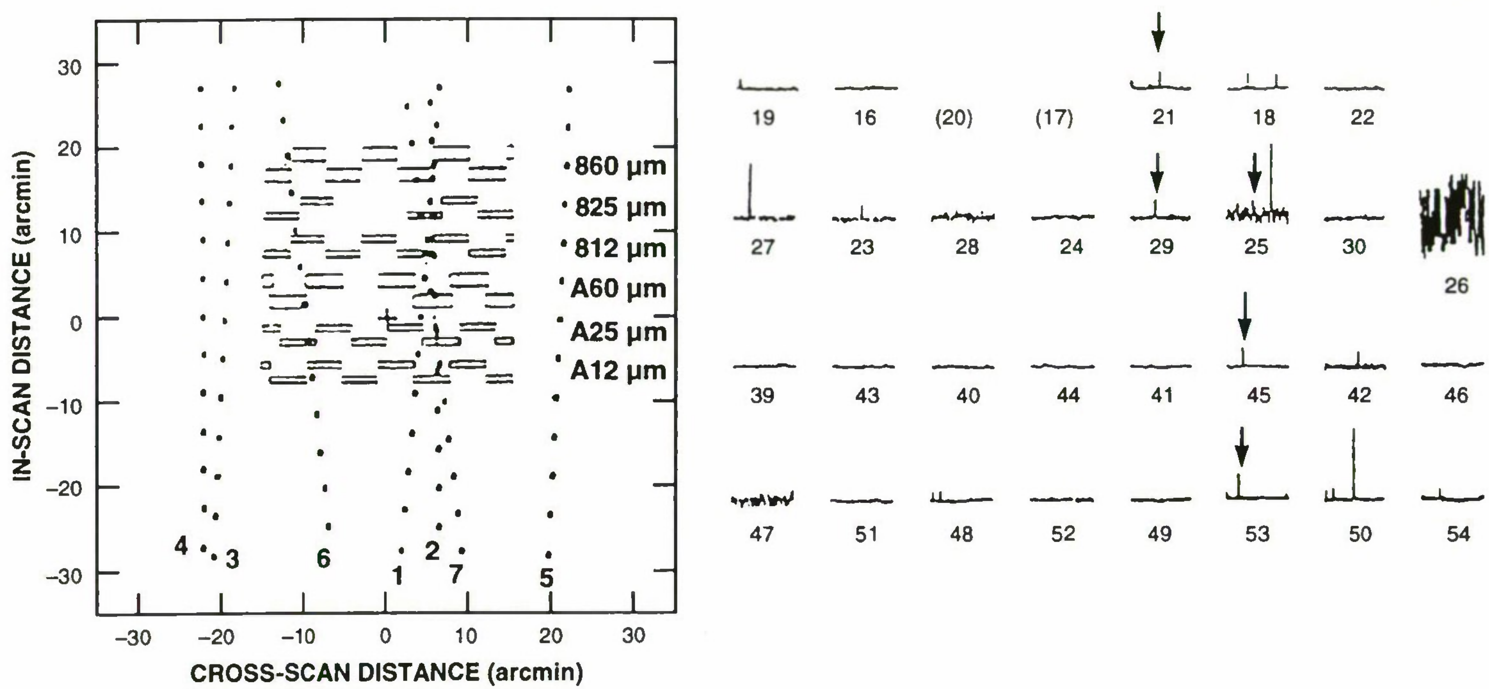


Figure 3. Response due to celestial objects.

The baseline IRAS method of seconds, hours, days, and weeks confirmation for object identification of a detection relies on the object being stationary. Since rapidly moving satellites and debris would be screened out, this method was abandoned. Wesselius et al. used the following approach. Satellites at a geometric range greater than 10,000 km will have an absolute velocity between 0.25 arcmin/sec (geosynchronous) and 10 arcmin/sec and apparent velocity between 4 and 10 arcmin/sec. The object can take more than 10 sec to cross the IRAS focal plane and will cross each detector at a different time, as illustrated in Figure 4. Here, the detector samples are displayed, as a function of time, for detectors arranged as they were on the focal plane. By correlating the time history of detections, the RSO and debris hits were selected from the raw data. From this data one obtains the amplitude of the hit in each detector, the position, and relative velocity of the object. Because of the relatively inaccurate position, the relative velocity is particularly important in correlating the hits with a catalogue of known satellite orbits.



SSC # 10002 FOCAL PLANE PASSAGE

SSC # 10002 DETECTIONS 18 APRIL 1983

Figure 4. SSC 10002 focal plane passage and detections.

3. ANALYSIS CONSIDERATIONS

The IRAS radiometric data is provided in Janskys uncorrected for color. The flux in-band was converted to Janskys "without prejudice" by assuming a λ^{-1} frequency distribution of the objects' radiation. This allowed processing the data without making assumptions about the temperature or wavelength distribution of the source, and the bands could be processing independently. Data reduced in this way is said to be uncorrected for color. The *IRAS Explanatory Supplement*, page II-27, describes how to make the color correction and obtain "true" observed Janskys. That procedure is implemented here using the tables given on page VI-26. Note that these tables can, in principle, be derived from the spectral response function, Table II.C.5, page II-18. These tables have been reconstructed to two significant figures. The source of disagreement is unknown, but it probably derives from subtleties in the implementation of the calibration process. The basic process for making the color correction is as follows.

The observed flux density, at a reference wavelength λ_o, for a source at temperature T, is

$$F_{obs}^{\lambda_o}(T) = \frac{\epsilon A}{\pi r^2} \mathcal{F}_{\lambda_o}(T) \qquad \left(\frac{W}{m^2 \mu}\right) ,$$

where the Planck flux density is

$$\mathcal{F}_{\lambda}(T) = \frac{3.74185\ x10^8}{\lambda^5 \left(e^{\frac{14388.3}{\lambda T}} - 1\right)} \qquad \left(\frac{W}{m^2 \mu}\right) ,$$

and λ is in microns (Allen), A is the projected area of the object, ϵ is the emissivity, and r is the range to the object. The IRAS data is reported in Janskys, viz., 10^{-26} W/m^2/Hz. Using the relation that $f\lambda = 2.99792458 \times 10^{14}$ μ/sec, one can convert $F_{obs}{}^{\lambda}$ to Janskys with

$$J_{obs}^{\lambda_o}(T) = F_{obs}^{\lambda_o}(T) \left(\frac{\lambda_o^2}{2.99792458\ x10^{-12}}\right) \qquad \left(\frac{W}{m^2\ Hz}\right) .$$

The temperature of an object can be found as follows. The temperature dependence of the observed flux $J_{obs}{}^{\lambda}(T)$ depends on λ_o. The observed flux also depends on ϵ, A, and r. Assuming ϵ is independent of λ, the ratio of observations made at the same time

$$\Re(T) = \frac{J_{obs}^{\lambda_1}(T)}{J_{obs}^{\lambda_2}(T)}$$

for bands λ_1 and λ_2 is a monotonic function of T. Given a pair of true flux densities, the temperature is obtained from this function. Now we define the color correction, K_λ, to convert the quoted, i.e., reported, flux density $f_\lambda = J_q{}^{\lambda}$ to the "true" observed flux density as

$$J_{obs}^{\lambda_o} = J_q^{\lambda_o} / K_{\lambda_o} \quad ,$$

or converting from Janskys to W/(m$^2\mu$) then

$$F_{obs}^{\lambda_o} = F_q^{\lambda_o} / K_{\lambda_o} \quad .$$

The ratio

$$\Re_q(T) = \frac{J_q^{\lambda_1}}{J_q^{\lambda_2}}$$

and the $K_\lambda s$ are also monotonic functions of T. They can be calculated from the spectral response function for each band. This calculation is described in the *IRAS Explanatory Supplement*, page VI-27. The temperature from the flux density ratios f_{12}/f_{25} and f_{25}/f_{60} can be obtained. The temperature obtained from the quoted flux density ratios is the same as that obtained from the color-corrected "true" observed flux densities.

Initial modeling of RSO flux and temperature for experiment planning is done assuming that the solar absorptivity α is equal to the LWIR emissivity ϵ. While this is appropriate for solar-cell-powered payloads of principal interest, many objects, particularly debris, may have surfaces with the value of absorptivity different from the emissivity, resulting in a large range of free-space temperatures.

To aid in the discussion a simple model for the radiant flux is developed. This calculation requires a number of assumptions. First, the object is in thermal equilibrium, and all the absorbed solar radiation energy is reemitted from each element following Lambert's law. Consequently, we ignore the energy that is reradiated as microwave radiation. Second, we assume there is no contribution for earth-upwelling radiation. Third, we assume that the satellite has one surface material, which absorbs solar radiation and radiates at a single temperature. Finally, we assume that the satellite is not in or near eclipse. We have developed four simple models, which are listed in Table 1. These constitute four idealized satellite configurations.

TABLE 1
Free-Space Temperature for Basic Satellite Shapes

Principal Shape	Temperature	n= A_s/A_p
Sphere	278 K	4
Cylinder (Radius r, Length L)	295 K	π(1+ r/L)
Flat Solar Panel (Two Sides)	330 K	2
Flat Solar Panel (One Side)	393 K	1

The free-space equilibrium temperature is determined by setting the solar power absorbed by the projected area equal to the total power reradiated by the surface area according to the Stephan-Boltzmann expression, in MKS units;

$$1360\ \alpha\ A_p = 5.6692x10^{-8}\ \epsilon\ A_s\ T^4\quad ,$$

where A_p is the projected area and A_s is the surface area.[1] This relation then gives

$$T = (393\ K)\left(\frac{A_p}{A_s}\right)^{\frac{1}{4}}\left(\frac{\alpha}{\epsilon}\right)^{\frac{1}{4}}\quad .$$

For these simple models using the solar radiation input of 1360 W/m^2, one can calculate the free-space temperature $T_{\alpha = \epsilon}$, assuming that the absorptivity α equals the emissivity ϵ. If the absorptivity is greater/lesser than the emissivity, the temperature will be greater/lesser than this calculated temperature. From the observed temperature and emissivity, we can obtain the absorptivity from

$$\alpha = \epsilon\left(\frac{T}{T_{\alpha=\epsilon}}\right)^4\quad .$$

The expression for total radiant intensity is then

$$watts\ /steradian = \frac{1360\quad \alpha\ A_p}{n\ \pi}\quad ,$$

where $n = A_s/A_p$, as given in Table 1. Thus, the total radiant intensity for a sphere is $108\,\alpha A_p$ watts/steradian. This simplified model requires that the object's radiance vs. wavelength be a Planck function with LWIR emissivity ϵ independent of wavelength. For objects in near-earth orbit, the effects of earth temperature, earth-reflected sunlight, and earthshadowing must be included in the RSO temperature estimate [12].

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[1] For this analysis, the value of the solar constant, 1360 W/m^2, is taken from Allan, page 169 [10]. Recent measurements from Nimbus–7 suggest a value of 1372 W/m^2 for 1983 [13].

4. SPACECRAFT MATERIALS

All model calculations depend on the physical properties of the satellite surface materials. For high-fidelity modeling, detailed information is necessary. Because this information is unavailable, illustrative values are used, as compiled by Dow [6] and reproduced in Table 2 for α and ϵ. Also given are temperatures for a sphere[2] (T1) and flat plate (T2) covered with the material. The values of α/ϵ range from 0.1 to 10.0. Figure 5 plots reflectivity ($\rho = 1 - \alpha$) vs. the tabulated α/ϵ ratios. As seen, almost all values of α and ϵ are possible. For example, the temperature of a gold-plated sphere can rise above the nominal 278 K, for $\alpha/\epsilon = 1$, to 494 K, and a sphere plated with magnesium oxide white paint can drop to 156 K. Single-sided flats can rise from the nominal 393 K, for $\alpha/\epsilon = 1$, to about 700 K!

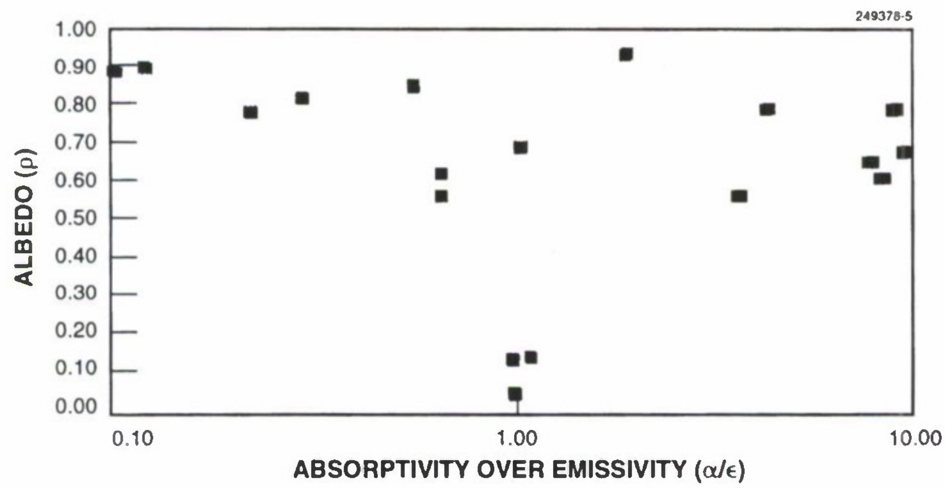

Figure 5. Reflectivity vs. α/ϵ for spacecraft materials.

There is a paucity of data on the dependence of ϵ with variables such as wavelength and temperature. Ross et al. [13] report measurements on silicon solar cells where they give the value of α = 0.78, and emissivity changes from 0.68 at –50°C to 0.78 at 150°C (see Figure 6). Blair et al. [14] report on extensive measurements on a number of materials with emphasis on solar cells manufactured by AEROJET. They measure the emissivity dependence on reflectance angle, temperature, and wavelength ranging from 2 to 24 μ (see Figure 7). From 2 to 18 μ the emissivity is generally between 0.8 and 0.9. There is a decreasing trend in emissivity for wavelengths greater 18 μ, although the data are inconclusive.

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2 Dow inverted this table. Dow used 1400 W/m^2 for the solar power, whereas 1360 W/m^2 is used in this analysis.

They report emissivity of about 0.9 at 200 K and less at 373 K. This is the opposite trend from that reported by Ross et al. Dow reports that the emissivity of white paint changes from 0.9 at 50 μ to 0.2 at 75 μ and to 0.1 at 100 μ. Therefore, some dependence of emissivity on temperature is expected, although even the sign of the slope is unknown. More probably we would expect the emissivity to decrease with increasing wavelength. This is consistent with Drudes's theoretical relation between the resistivity ϱ of a metal for a definite wavelength [15].

$$\epsilon_\lambda = 0.365\sqrt{\frac{\varrho}{\lambda}}\ .$$

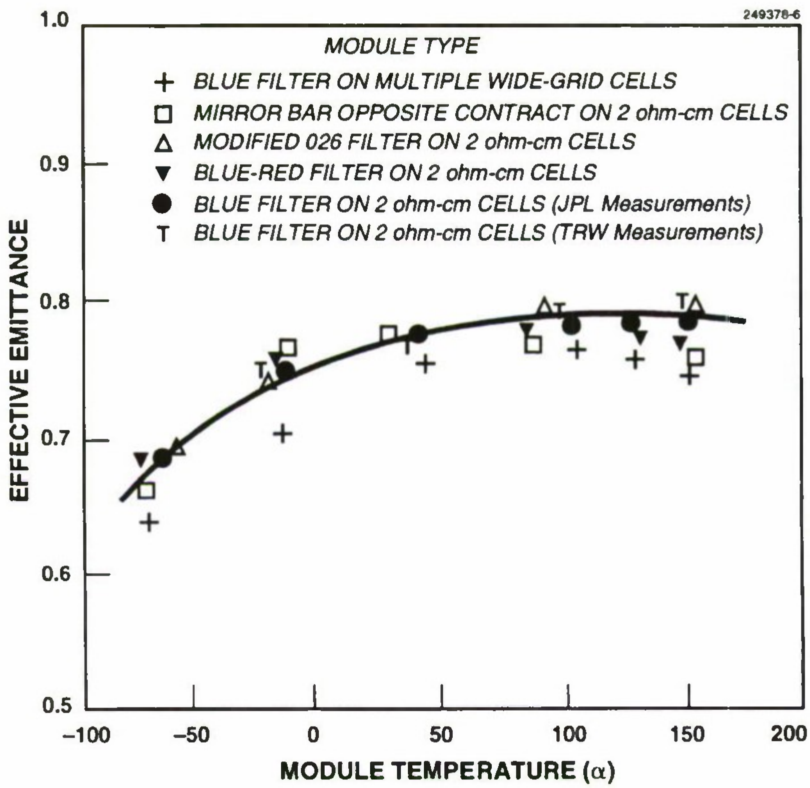

Figure 6. Emissivity vs. temperature for silicon solar cells.

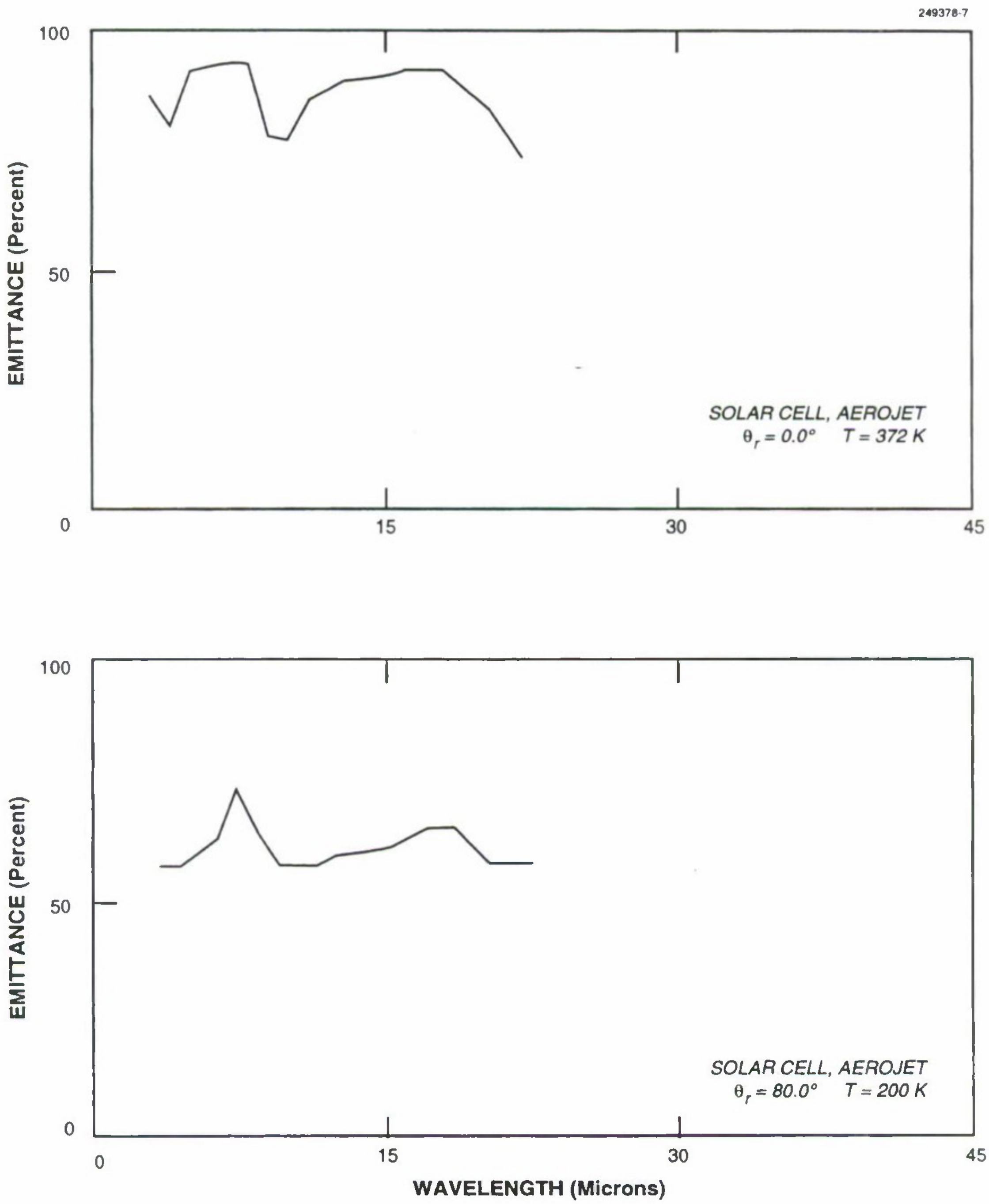

Figure 7. Emissivity vs. wavelength for silicon solar cells.

Currently, it is not generally known if the values of α/ϵ change with time in space. For optical solar radiators, α/ϵ does change from 0.08 to 0.2 or more over 10 years [18]. This is inferred from the increase in electronic component temperature. Results from the Long Duration Experiment Facility (LDEF), in orbit for almost six years, provide some indication. As summarized by Dow, for anodized aluminum (the primary LDEF surface coating), the values of ϵ did not change significantly, whereas the value of α increased by as much as 16%, depending on the location of the sample. However, white paint exhibited increases as large as 100%. Such phenomenon may help explain the high and low temperatures reported here.

TABLE 2
Typical Absorptivity and Emissivity for Spacecraft Materials

Material	ρ	$\alpha = 1-\rho$	ϵ	α/ϵ	T1	T2
AlO_3 on Buffed Aluminum	0.87	0.13	0.23	0.57	243	289
Vapor Dep. Gold on Glass	0.96	0.04	0.02	2.00	333	396
Vapor Dep. Silver on Glass	0.81	0.19	0.02	9.50	492	585
Solar Cell (IUE)	0.14	0.86	0.84	1.02	282	335
Stainless Steel (Polished)	0.58	0.42	0.11	3.82	392	465
Fiberglass	0.15	0.85	0.75	1.13	289	344
Polished Aluminum 6061	0.81	0.19	0.04	4.52	408	485
Unpolished Aluminum 6061	0.63	0.37	0.04	8.81	483	574
Anodized Aluminum	0.58	0.42	0.63	0.67	254	302
Silver	0.96	0.04	0.02	2.00	333	396
Gold (Plated)	0.70	0.30	0.03	10.0	498	593
TiO White Paint	0.80	0.20	0.90	0.22	192	228
Black Paint(#M Velvet)	0.05	0.95	0.92	1.03	282	336
Aluminum Paint	0.71	0.29	0.27	1.07	297	353
1.0 mil Aluminized Mylar*	0.84	0.16	0.54	0.30	207	247
1.0 mil Silverized Teflon†	0.92	0.08	0.66	0.12	165	196
1.0 mil Aluminized Kapton‡	0.64	0.36	0.54	0.67	254	302
Magnesium Oxide White Paint	0.91	0.09	0.90	0.10	158	187
Platinum Foil	0.67	0.33	0.04	8.25	475	565
* Trade name for polyethylene terephthalate						
† Trade name for fluorinated ethylene propylene						
‡ Trade name for polyamide						

5. CALIBRATION ISSUES

The IRAS data received from Groningen was processed with the calibration described in Beichman's report [9]. Since that publication, a number of analyses have questioned the calibration [16,17,18,19,20,21]. Some consider the calibration confirmed (Aumann [22]), whereas a number of analyses suggest the various wavebands are in error by 2% to 12%. The proposed corrections are listed in Table 3. The weight of evidence suggests that some calibration correction may be warranted. The calibration correction adopted for this analysis is also given in Table 3. In this analysis, there is no way to quantify or assess the absolute calibration, as we do not have independent information about the satellite emissivity, absorptivity, or temperature. It is the determination of these quantities that is the objective of this analysis.

TABLE 3
IRAS Calibration Errors

Source	12 μ	25 μ	60 μ	100 μ
Aumann	0	0	0	0
Tedesco	0	10%	10%	?
Gillett	0	6%	0	?
Kirby et al.	0	10%	0	0
Cohen et al.	2%	6%	3%	12%
Used Here	0	0	0	NA

6. DATA PROCESSING

Each detection report contains, among other information, the epoch, direction in right ascension and declination, angular rate crossing the focal plane, and the flux, in uncolor-corrected Janskys, for each detector registering a "hit."

The objectives of this analysis are to identify those detections of known satellites and to analyze the radiometric data for information about IR observations of artificial earth satellites. There were four steps in preparing the data for analysis.

1. The observed direction of all detections in the Groningen debris data base was compared with directions computed from an ephemeris of the IRAS satellite and the catalogue of known satellite element sets. Observations were accepted if the observed and computed direction agreed to 0.60° or better and the observed and computed angular velocity agreed to 0.5 arcmin/sec.

2. The individual hits for each detection were screened. The intention was to eliminate hits where the satellite image (assumed a point source) did not completely cross a detector, as a partial hit would give a biased flux estimate. The screening was done as follows. As seen from the focal plane geometry (see Figure 2), the detectors for each waveband are in two rows with some overlap. Therefore, in each detection one would expect that two hits would be registered for each waveband. In cases where three or more hits are registered, it is assumed that some of them are at a detector edge and therefore do not give a good flux measurement. Therefore, the screening was that for detections with three or more hits, the two hits with the largest flux density measurement were accepted. This eliminated some, but probably not all, partial detector hits. An example of the editing of the data for SBS1 (12065) is presented in Table 4. The sighting time for each detection is given as the day of the year 1983. The record number is a unique identifier in the Groningen IRAS debris data base. The object number is 12065. The observed in-scan velocity is given in arcmin/sec. In each detection, all the hits are given, and the detector is identified. A number of triple hits are observed. The discarded hit is noted with an asterisk. Hits were discarded for other reasons. The detection on day 222.032 was discarded because of the anomalous in-scan velocity. Other hits discarded, based on a statistical test, were in detections on days 71.535 and 72.537.

3. The detections for each satellite were collated.

4. The flux density measurements were color corrected and analyzed to obtain physical properties of the satellite using other observed information such as the range and physical size. Information such as temperature and emissivity were derived.

TABLE 4
Detector Hits for SBS1

Sighting Time	Rec Num	Obj Num	InsV	D12	Flux12	D25	Flux25	D60	Flux60
48.55410004	2004	12065	4.38	50 25	1.83 1.80	42 18	2.22 2.54	34 10	1.39 1.48
142.00761414	55033	12065	4.64	52 28 24	1.70 0.63* 1.90	44	2.43	13 9	0.43 1.10
69.53096771	79019	12065	4.46	51 27	1.86 1.92	39 19	2.80 2.65	35 31	0.91 1.44
70.53330231	79814	12065	4.46	48 23	1.83 1.98	43 40 16	0.65* 2.59 2.32	32 13 8	1.09 0.65* 1.23
71.53556824	80687	12065	4.47	49 24	1.76 1.88	44 41	0.42* 2.53	33 9	0.85 1.08
72.53787231	81955	12065	4.47	53 25	3.37* 2.22	45 21	2.13 2.27	37 14	1.22 0.98
73.54016876	82421	12065	4.53	54 30	1.65 1.87	46 22	2.49 2.07	38 15 10	2.19 1.39 0.62*
222.03245544	146290	12065	3.42	51 28	0.56* 1.13*	40	2.26*		

7. GENERAL RESULTS

Table 5 summarizes the result of correlating with the satellite catalogue. The number of correlations is given for a variety of error bounds. The 2072 detections with angle errors less than 0.6° are believed to be valid satellite detections. The remaining detections contain uncatalogued objects (UCTs), debris, and false detections. These will not be discussed further.

TABLE 5
IRAS Data Correlation Results

Number of IRAS sightings compared with catalogue		136304
Number of correlations		
Crude filtering		30600
< 4°		9955
< 1°		2469
< 0.6°		2072
Number of satellites correlated		465
Statistics	**vs. IRAS DB**	**vs. Correlations**
Correlations	22%	
< 4°	7%	33%
< 1°	2%	8%
< 0.6°	2%	7%

The Wesselius's original publication [8] displayed the data in an interesting way. From the observed flux ratio, say $f_{12\mu}/f_{25\mu}$, one can determine the temperature of the body, assuming the emissivity is constant. One would expect the temperature measured with the $f_{12\mu}/f_{25\mu}$ ratio to be the same as that obtained from the $f_{25\mu}/f_{60\mu}$ ratio. This is plotted in Figure 8 from Wesselius et al. for the 1500 detections with fluxes greater than 3 Jy. The wide scatter belies our expectation. The same plot is provided for the correlated data before the screening for partial hits (see Figure 9). Instead of selecting detections based on large flux density, we have selected detections based on known satellite detections. A similar scatter is evident. Next, the same plot is provided for temperature derived from the screened flux density measurements (see Figure 10). In this case, the values fall on a straight line, and the scatter is significantly

reduced. From the $f_{12\mu}/f_{25\mu}$ flux ratio, the average temperature of about 300 K is clearly evident. We believe the large scatter in the original IRAS data is due in part to partial detections. In principle a partial detection could be corrected given precise knowledge of the IRAS position and pointing and the satellite position.

Another way to characterize the IR satellite measurements is given in Figure 11. Here, the 12-μ flux density is presented as a function of the range to the observed target. The envelope corresponds to the $1/r^2$ dependence, and its position depends on the sensitivity of IRAS and the maximum size of objects in 1983. A number of detections are at a greater-than-geosynchronous range. These are genuine since they are Astron, Exosat, and other known satellites. The individual fluxes are given in Appendix A.

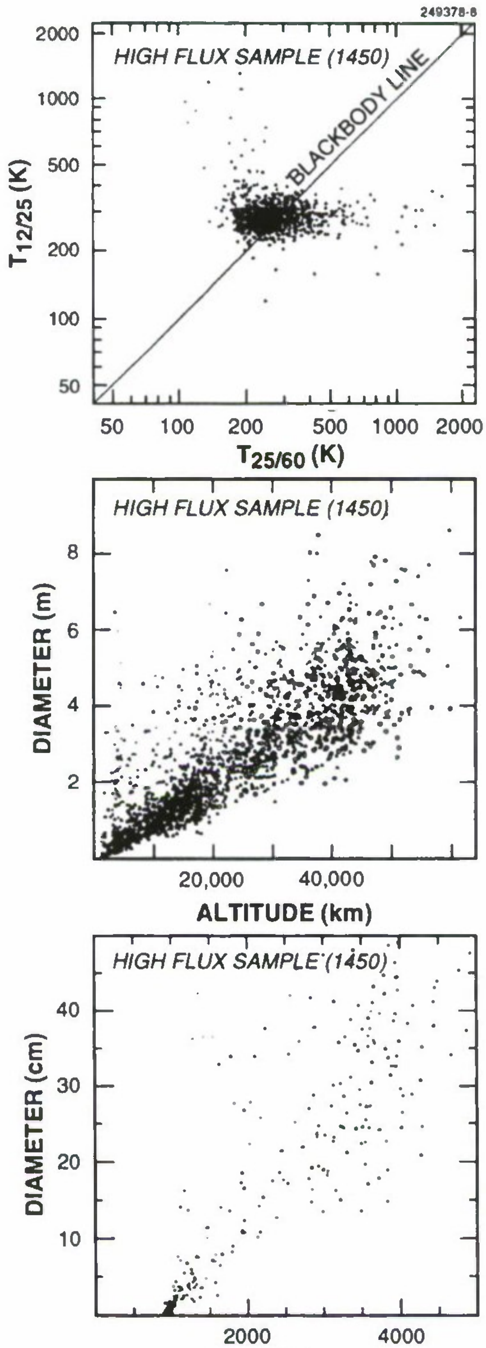

Figure 8. Temperature from 1500 large flux sample detections.

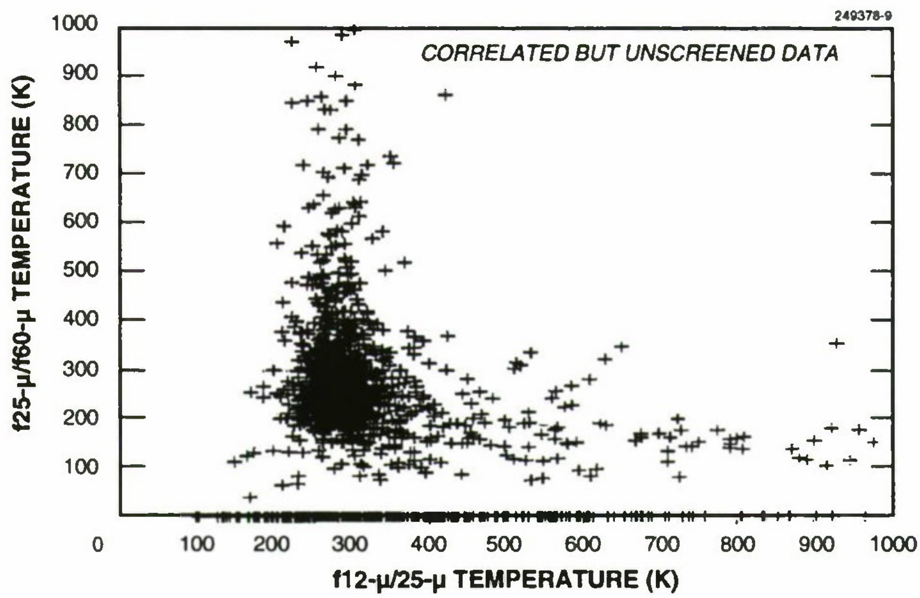

Figure 9. Temperature from correlated and unscreened data.

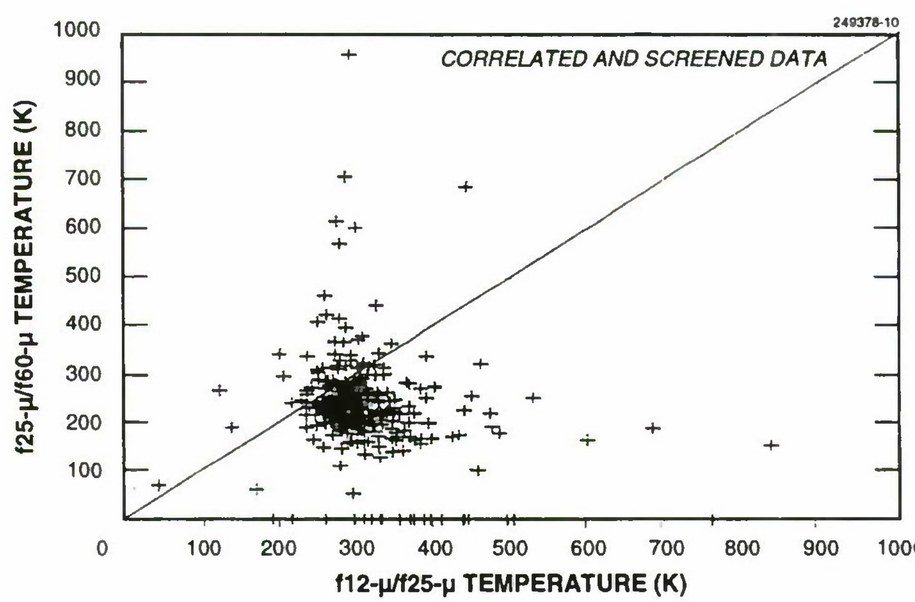

Figure 10. Temperature from correlated and screened data.

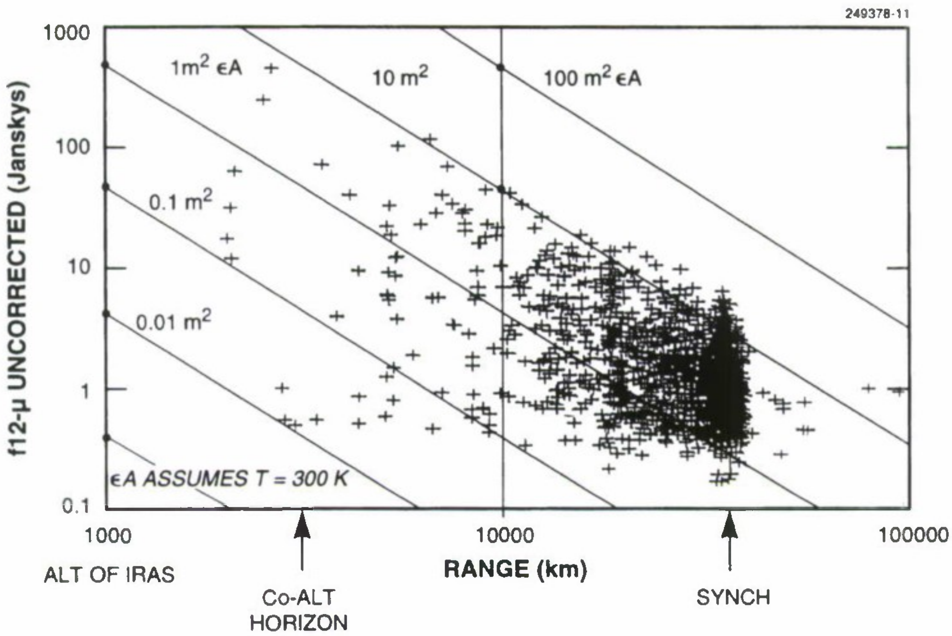

Figure 11. Flux density vs. range.

8. REFERENCE SPHERES

Isothermal spheres are the simplest and easiest satellite shapes to analyze. A single IRAS focal plane crossing has been correlated with the polished aluminum Lincoln Radar Calibration Sphere LCS1 (SSC # 1361). Although there is only one detection, the analysis of this data is instructive. The temperature is determined to be 480 K using the screened uncolor-corrected flux density ratio of $J_q^{12\mu} =$ 17.69 Jy at 12 μ over $J_q^{25\mu} =$ 11.22 Jy at 25 μ. The radiant flux density of LCS1 at 480 K is $\mathcal{F}_{12\mu}(480) =$ 134.8 W/μ/(effective ϵA) at a 12-μ reference wavelength.

The IRAS color correction (Beichmann, Table VI-26) adjusts the reported 12-μ flux density to $J_{obs}^{12\mu} = 16.55$ Jy, which is equal to $F_{obs}^{12\mu} = F_q^{12\mu}/K_{12\mu} = 3.45 \times 10^{-13}$ W/(m$^2\mu$) spectral irradiance. Now at a range of 2001 km, determined from the a posteriori ephemeris, the observed spectral radiant intensity is $\pi r^2 F_{obs}^{12\mu} = 4.34$ W/μ.

Now the effective area ϵA is the observed spectral radiance at 12 μ (W/μ) divided by the Planck function value of the radiant flux density [W/(m^2 μ)] at the same reference wavelength.

$$\epsilon A = \frac{\pi r^2 F_{obs}^{12\mu}}{\mathcal{F}_{12\mu}(480)} = 0.0322 \; (m^2) \; .$$

Thus, ϵA is 0.0322 m^2, but since the projected area for LCS1 (1361), A = 1 m^2, the emissivity is $\epsilon =$ 0.0322.

The ratio of solar absorptivity to emissivity $(\alpha/\epsilon)^{1/4}$ is equal to the observed temperature, 480 K, divided by 278 K, the characteristic free-space temperature for an isothermal sphere. Thus, $\alpha/\epsilon = 8.89$, $\alpha = 0.286$, and the reflectivity is $\rho = 1 - \alpha = 0.7139$.

Data on the optical properties of various spacecraft materials give values for aluminum as shown in Table 6.

The radar calibration sphere may have a less polished surface than when launched a quarter century ago, thereby increasing the absorptivity—i.e., reducing the reflectivity—toward the values given for unpolished aluminum.

The IRAS result can be compared with visible band measurements. The apparent visual brightness resulting from a specular sphere with $\rho A = 0.714$ m^2 at a 2000-km range is given by

$$M_v = -26.78 - 2.5 \log\left(\frac{0.714}{4\pi(2x10^6)^2}\right) = 7.84 M_v \; .$$

TABLE 6
Optical Properties of Aluminum

	α	ϵ	α/ϵ	ρ	T (K)
LCS1 Observed	0.286	0.0322	8.89	0.714	480
Polished Al	0.19	0.042	4.52	0.81	408
Unpolished Al	0.63	0.042	8.81	0.63	483

This calculated brightness can be compared with the brightness observed by W. Beavers [2] as a function of phase angle. The value derived from IRAS for M_v is 7.84 M_v at 2001 km. This can be referred to geosynchronous distance, ≈ 36,000 km, with an adjustment of 6.275 M_v. Therefore, IRAS predicts 14.11 M_v at geosynchronous range. This is in moderate agreement with Beavers's observations reported at geosynchronous range that give a value, at 90° phase angle, of 14.0 M_v. Beavers notes that his observations indicate that 12% of the energy is diffuse. Additional LWIR and visible band measurements at the same epoch are required for a high-accuracy comparison.

Finally, consider the thermal response of LCS1, a 1-m sphere, with a 2-cm-diameter solid aluminum sphere covered with Martin Black with $\alpha = \epsilon = 0.999$ as it enters the earthshadow. The cooling rate, neglecting earth-upwelling radiation, is

$$\frac{dT}{dt} = -\frac{5.67x10^{-8}\ T^4\ \epsilon\ A\ (1-\xi)}{c_p\ M} \left(\frac{kW}{J}\right) ,$$

where c_p is the specific heat, M is the mass, and $(1 - \xi)$ is the fraction of the sphere radiating to free space. Now, the temperature of a sphere is written as

$$T = 278 \left(\frac{\alpha}{\epsilon}\right)^{\frac{1}{4}} ,$$

giving

$$\frac{dT}{dt} = -\frac{338.65\ \alpha\ A\ (1-\xi)}{c_p\ M} .$$

Now, the area-to-mass ratio of the two spheres, $(A/M)_{(1361)} = 0.0285\ m^2/Kg$, and $(A/M)_{(2\ cm)} = 0.0252\ m^2/Kg$, is virtually the same. The cooling rate for LCS1 (1361) is therefore expected to be about 0.286 that of the 2-cm emissive calibration sphere coated with Martin Black, which results in a temperature excursion less than 10 K. Therefore, LCS1 would provide a relative stable temperature reference.

9. SPIN-STABILIZED CYLINDERS

Spin-stabilized, solar-cell-covered cylinders appear to be simple objects for radiometric analysis. There were 80 such nonmilitary satellites in orbit during the IRAS sky survey compared to 20 three-axis stabilized satellites. The putative simplicity of spin-stabilized cylinders led to early analysis of that data.

The first geostationary satellite, Syncom B, a 28-in-diameter and 15-in-high spun cylinder, was launched in 1963. The cylinder weighed 85 lb. The solar power was 30 W, and the satellite had a lifetime of 18 months. Now, 30 years later, Hughes (the same company that built Syncom) deploys two-ton cylinders, 12 ft in diameter and 30 ft high with 2000 W of solar power at the end of a ten-year life.

The first cylinders employed dipole antennas, sometimes in phase switched arrays, to provide moderate gain in the earth direction. Later, satellites used high-gain parabolic reflectors on a despun platform at the top of the cylinder. The other end of the cylinder was left open, and a second concentric solar-cell-covered cylinder slid down over the apogee kick motor after geosynchronous orbit was achieved. These geosynchronous orbits have nearly 0° inclination and circular orbits with the spin axis maintained normal to the orbit plane, i.e., normal to the earth's equatorial plane. The IRAS orbit geometry results in observations of geosynchronous satellites near quadrature, i.e., at an illumination phase angle between 80° and 100°. The measured flux density from these cylinders is expected to be a weak function of phase angle, which is in contrast to flat solar panels that exhibit a $\cos(\phi)$ relationship. The LWIR detections of spin-stabilized cylinders are therefore expected to be the simplest to understand.

The simple LWIR model used here treats only the main cylindrical body. The LWIR radiance of the antenna and despun platform are ignored for two reasons. First, they are covered with reflective thermal insulating material. Second, because of the IRAS geometry, the observations are made when the parabolic antenna is edge-on to the sun, it is cool, and its radiation is ignorable. The LWIR energy radiated from the open bottom of the cylinder is also ignored in the energy balance calculation. Now, the cylinder, spinning on the order of once per second, is certainly near thermal equilibrium, and only the projected area is considered. Incidentally, the cylindrical geometry produces only $1/\pi$ as much power as an equal number of solar cells on a flat panel normal to the sun.

From information about solar cell absorptivity and emissivity it is known that about 10%–15% of the incident solar power is reflected by the solar cells $\rho = 1 - \alpha$. About 15% of the incident solar power is converted to electrical power. This leaves about 75% of the solar power to be reradiated to achieve thermal equilibrium. The free-space temperature of a solar panel is changed by

$$(\alpha/\epsilon)^{1/4} \quad ,$$

where $\epsilon \approx 0.85$, and $\alpha \approx 0.75$. Note that $\alpha = 1 - \rho - \eta$, where the symbol for reflectivity is ρ and the symbol for solar cell efficiency is η. It is the fourth root of the ratio of this net absorptivity, $\alpha \approx 0.75$, to emissivity, $\epsilon \approx 0.85$, that determines the temperature of a given-shape solar panel.

Most cylindrical payloads were built by Hughes, including the giant HS-393 class, which includes SBS-6 and INTELSAT-6 (all launched after 1983). The Hughes Galaxy class, HS-376, Figure 12, was

selected for initial analysis because of the number of IRAS detections, ≈ 60, on eight individual satellites that were obtained. In addition, they had flux densities exceeding 2 Jy. Now, the HS-376 class was the first to radiate heat from the electronics using a cylindrical optical solar radiator (OSR). Previous designs radiated the heat from the electronics upward toward the antenna via the despun platform. To obtain the simple model for the cylinder, it is assumed that the radiator power is equal to the reradiated power of the solar panel it replaced. The HS-376 was also the first to increase the solar cell collection area by sliding a concentric solar cylinder down to cover the apogee kick motor after geostationary orbit was achieved.

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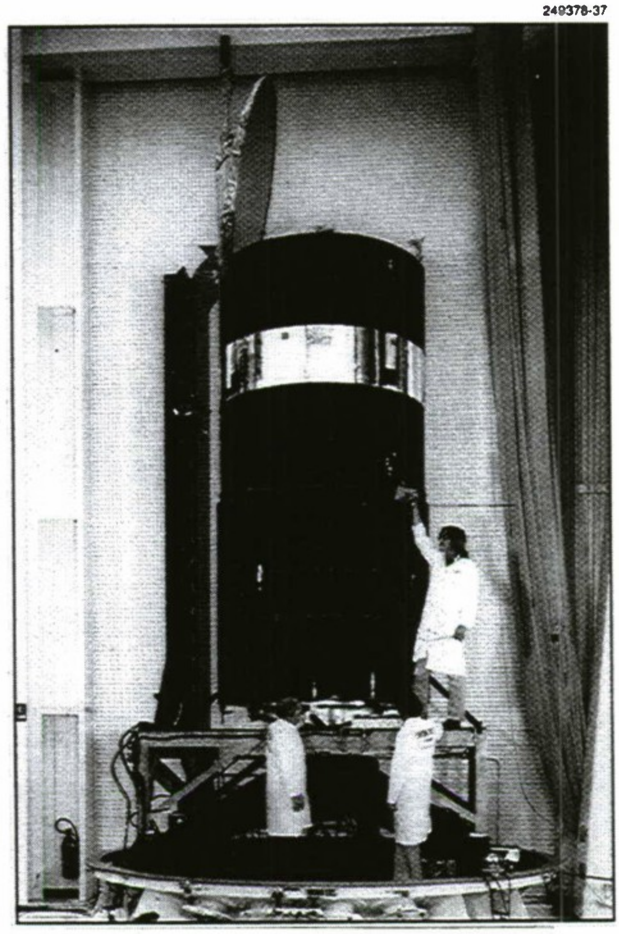

Figure 12. Hughes HS-376 satellite.

The eight Hughes cylinders observed by IRAS are listed in Table 7. Figure 13(a), (b), and (c) plots the detections as a function of time; there is no indication of a temporal trend, and we would expect none. This confirms the constancy of the IRAS calibration. Therefore, we have taken an average of all the screened detections and obtained the mean values given in Table 7, which are accompanied by the formal uncertainty. In general the average flux is obtained to ± 0.1 Jy. With this statistical population, the accuracy of a single hit is estimated as ± 0.6 Jy. The object temperature is obtained as described above. We adopted the temperature derived from the $f_{12\mu}/f_{25\mu}$ ratio as the object temperature for further analysis. Given the temperature, one can then recover physical properties of the satellite as follows. The observed flux densities are color corrected to find the true flux density. Since the range is known from the ephemeris used for correlation and the self-emitting projected surface area of these satellites, A_p = 8.84 m^2, the emissivity can be calculated in each waveband from

$$\epsilon_{\lambda_o} = \frac{J_q^{\lambda_o}}{K_{\lambda_o}(T)} \frac{\pi r^2}{A_p \; J_o^{\lambda_o}(T)} \quad .$$

The calculation of emissivity for the eight Hughes cylinders is given in Table 8. Note that the 12- and 25-μ band emissivities are in good agreement with each other, as they should be since they were assumed to be so for calculation of the temperature. The 12- and 25-μ emissivities are also in good agreement with published values (Table 2), whereas the 60-μ values are not. We assume that either there is an (unlikely) calibration error in the 60-μ band or there is a real difference in solar cell emissivity at 60 μ. Finally, the solar absorptivity of the satellites can be calculated as described above. The absorptivity calculated in this way is also listed in Table 8.

From the HS-376 results, a convenient rule of thumb is postulated relating the observed 12-μ flux $J_{12\mu}$ to projected solar cell area A_p

$$A_p \approx 5 \; J_{12\mu} \qquad (m^2) \quad .$$

This leads to a relation between power and observed flux

$$W \approx 500 \; J_{12\,\mu} \qquad (W)$$

for nominal 10% solar cell efficiency.

TABLE 7

IRAS Detections of Hughes HS-376 Cylinders

Sid	Name	12 μ Jansky	#	25 μ Jansky	#	60 μ Jansky	#	T12/25 K	T25/60 K
12065	SBS-1	1.86±0.04	13	2.42±0.11	12	1.20±0.19	14	297	223
13069	WESTAR 4	1.59±0.06	16	2.30±0.08	16	1.01±0.12	16	284	247
13269	WESTAR 5	1.78±0.03	6	2.48±0.22	5	1.02±0.19	5	288	263
13651	SBS-3	2.03±0.10	2	2.68±0.10	2	1.25±0.10	2	296	235
13652	ANIK C3	1.87±0.10	12	2.67±0.11	12	1.00±0.34	10	286	287
13431	ANIK D1	1.83±0.11	10	2.74±0.08	10	1.14±0.08	10	279	261
14158	Galaxy 1	1.61±0.19	12	2.39±0.16	12	1.04±0.39	12	280	250
14134	PALAPAB1	1.52±0.10	2	2.64	1	0.98±0.10	2	260	291

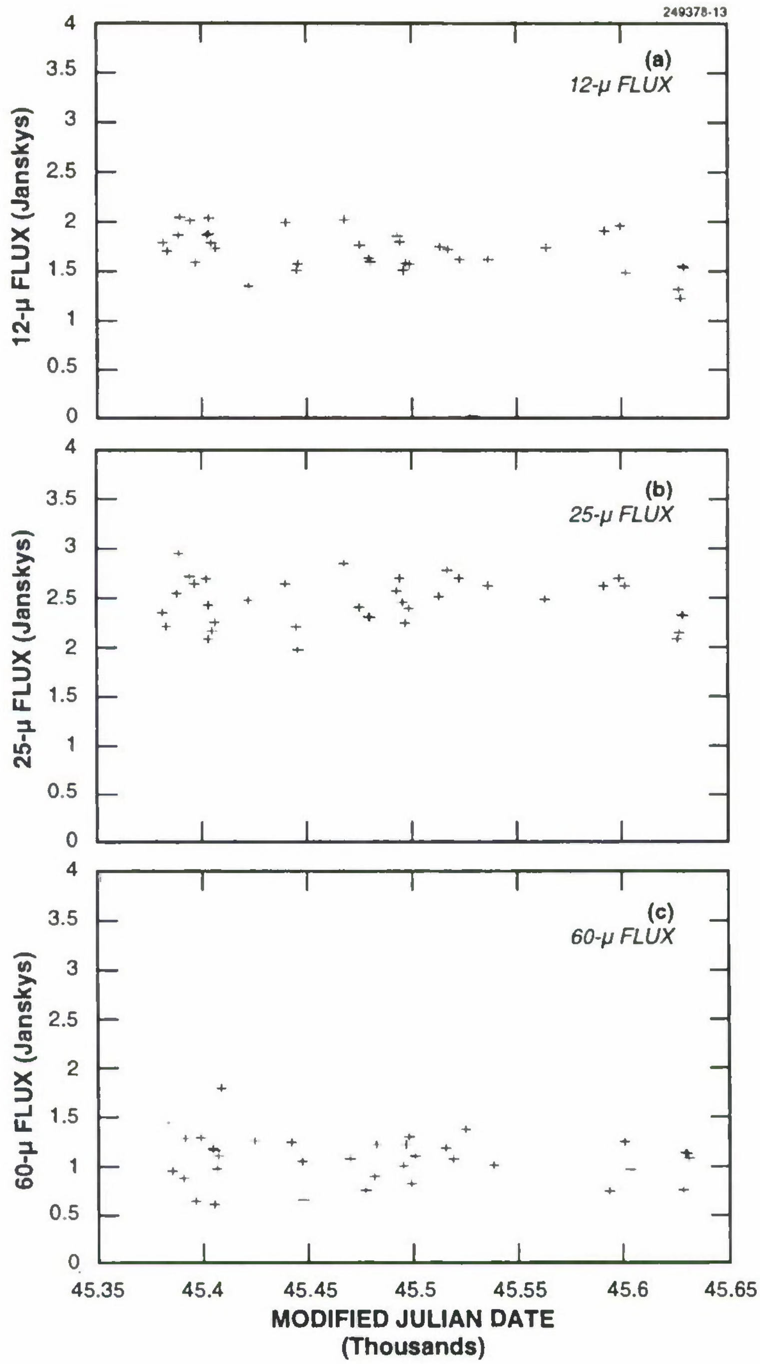

Figure 13. Flux vs. time for Hughes HS-376 cylinders.

The general result for analysis of spin-stabilized cylinders is that relatively simple models can give important information about these satellites. Assuming that solar cells are the primary source of LWIR flux seems a workable assumption. It allows inference of effective emissivities and possibly some inference about the solar cell power available.

The HS-376 spacecraft observed by IRAS were assumed initially to be more or less identical and were expected to yield the same flux densities and temperatures. The values of flux density for a given spacecraft were averaged without adjustment for possible seasonal variations. However, individual spacecraft had important differences, some of which could explain the difference in observed characteristics. WESTAR 4 and 5 have shorter solar panels and corresponding lower power [23]. If the radiator is the same size, which is not documented, the two WESTARs have only 7.8 m^2 projected area compared with the other HS-376 with 8.84 m^2. Thus, the WESTARs have 0.88 of the area, and this is in good agreement with the 12-μ flux density ratio of 0.87 of the average of the two WESTARs compared with the two ANIKS (1.613 Jy/1.851 Jy). In addition, the two SBS satellites had IRAS-derived temperatures about 15 K higher than the other spacecraft. This may be due to the smaller number of 20-W TWT amplifiers employed. Yenne [24] reports that SBS satellites had only 10 TWTs compared with the usual 20 on other satellites. Another possible source of difference is that early spacecraft were launched without baking out the solar cell panels to remove the water from the hydroscopic solar cell adhesives. Both SBS-1 and WESTAR 4 were not baked out before launch, resulting in a few percent lower solar power for several months during outgassing in orbit. However, outgassing should have been completed long before the IRAS data was taken.

The most startling difference among spacecraft is the switch from a K7 Spectrolab solar cell to the mixture of K7 and K4¾ cells on the Galaxy 1. The K7 cells have been featured as having the highest peak solar output (19 mW/cm^2), albeit with higher temperature resulting from a higher absorptivity, $\alpha \approx$ 0.84. The K7 cells are thin (2.5 mils) and have a textured front surface together with an aluminized rear coating that reflects near-IR back through the cell for increased power generation. The K7 was particularly extolled for use on the deployable solar panel where the characteristic excess heat could be easily radiated [25]. Apparently, the K7 cells on the fixed panels flanking the radiator made it more difficult to control the temperature of the electronics and batteries behind the radiator panel.

The design of high-power, long-lived, solar-cell-covered cylinders is strongly driven by the temperature control required for electronic components and batteries, which power the RSO during earth eclipse near equinoxes. The solar cells are cemented to 1/2-in-thick, Kevlar-faced, aluminum honeycomb structural panels. In the early Hughes 376 series, the new K7 high-efficiency solar cells were used on both the fixed upper (forward) and deployable (lower) cylinders. The switch to the cooler K4 ¾ solar cells suggests a temperature control issue.

TABLE 8

Emissivity and Absorptivity for HS-376 Cylinders

Sid	Name	J12/J25	T(K)	J12/J25*	$\epsilon_{12\mu}$	$\epsilon_{25\mu}$	$\epsilon_{60\mu}$	α
12065	SBS-11	0.7690	297	0.9645	0.73	0.72	0.98	0.75
13069	WESTAR 4	0.6910	281	0.8749	0.85	0.88	1.02	0.74
13269	WESTAR 5	0.7160	288	0.9055	0.92	0.91	0.99	0.82
13651	SBS-3	0.7570	295	0.9519	0.82	0.82	1.03	0.82
13652	ANIK C3	0.7018	284	0.8882	0.89	0.89	0.82	0.77
13431	ANIK D1	0.6690	277	0.8480	0.97	0.97	1.03	0.76
14158	Galaxy 1	0.6763	278	0.5570	0.83	0.83	0.93	0.67
14134	PALAPAB1	0.5739	258	0.7307	1.13	1.13	1.00	0.67

* Color Corrected
See Table 7 for physical dimensions.
Free-space temperature = 295 K.

The OSR has quartz panel sections with second surface mirrors and black backing coatings. The initial solar absorptivity-to-reflectivity ratio is less than 0.08. Thus, the radiator cooling section, between the two upper solar panels, acts as a one-way mirror that reflects sunlight and allows heat from the TWTs, nickel cadmium battery cells, etc., to radiate into free space. The electronics shelf, including the RF output TWTs behind the radiator, is on the despun platform with the antenna and feeds. The batteries spin with the solar panels. The rise of spacecraft temperature of several degrees over its lifetime has been attributed to the slow degradation of the OSR's α/ϵ.

The power system for spacecraft usually comprises two redundant main array buses together with battery charge and trickle arrays. The nearly 14,000 solar cells of the HS-376 spacecraft are connected in various "strings" of series-parallel configurations, with protective diodes, to allow graceful degradation in the event of string failure.

Hughes's modeling of solar cell power, voltage, and current predicts performance within a few percent. This is confirmed by several years of telemetry. Temperature is also modeled, but telemetric data agrees with models to only ±6% of the typical solar panel temperature (283 K). The seasonal variation of bus voltage due to the 23.5° obliquity of the ecliptic and the earth orbit eccentricity is clearly observed in the models. The temperature cycle is not so apparent since at eclipse season, when more solar power is available during sunlight, more power must be used to recharge the batteries following the eclipse.

More detail about solar cell panels is given for the HS-376 successor, the HS-393 [26]. Table 9, taken from Fodor et al. converted to degrees Kelvin, summarizes the predicted array panel temperatures by season and for the beginning and end of life. K4¾ cells are used only on the fixed panels, and the K7 cells are used on the deployable panel. Though the total power of the two buses is over 2000 W, the number of solar cells required is not larger than for HS-376 because much larger solar cells have been developed to simplify fabrication. Note that the temperature of the K4¾ cell panel is higher by 5–9 K than the K7 panels, except near winter solstice. This indicates that equipment temperatures are better controlled with the K4¾ cells near the radiator. Incidentally, the lower panel falls to 191 K before emerging from eclipse. Also note the trickle charge panel rises to 306 K at winter solstice as the sunlight partially illuminates the inside of the lower cylinder.

It was recently learned that in the mid-1970s solar cell improvements foretold an operational increase in watts per square meter of 30% to 50%. Allison et al. [27] describes an improved "violet" cell (announced in 1972) with vastly improved response to the blue-violet solar spectrum that achieved at least a 30% increase in solar power over the conventional cell in use. The COMSAT nonreflective (CNR) cell announced in 1974 offered a 50% increase in power above the conventional cell as well as increased radiation hardness. The solar efficiency η is 15.4%.

TABLE 9
Nominal Solar Panel Temperature for HS-393 Satellites

Date	Years in Orbit	K4¾	K7 Deployable		
		Array Temperature (Deg K)			
		Panel A1	Panels C1-C4 MC1	Panel MC2	Panel Tc
Summer Solstice	0	275.8	266.9	268.0	265.2
	10	278.0	266.9	268.0	265.2
Autumnal Equinox	0	280.8	275.8	277.4	272.5
	10	283.0	275.8	277.4	272.5
Winter Solstice	0	276.3	297.4	289.1	305.8
	10	278.6	298	289.7	305.8
21 March Post-Ecl	0	191.3	144.7		

Meulenberg [20] also advises that $(\alpha - \eta)/\epsilon$ is a better indicator of cell temperature than α/ϵ. Table 10, taken from the COMSAT paper, tabulates the properties of conventional cells, the violet cell, and the CNR cell. We have added the calculated cell temperature modeled on a cylindrical satellite

$$T \doteq 295 \left(\frac{\alpha - \eta}{\varepsilon} \right)^{\frac{1}{4}} .$$

The CNR cell clearly has a higher temperature, and the paper suggests that a specific cover slide would increase the emissivity from 0.803 to 0.843, thereby somewhat ameliorating the temperature increase. The K7 cells used on the early Hughes HS-376 class satellites are more or less equivalent to the CNR cells. IRAS data on seven of the eight observed satellites were reexamined—the PALAPA B1 detection was excluded—to correlate the observed temperatures with the solar cell models. The results are given in Table 11.

TABLE 10
Solar Cell Types and Temperature

Type	Electrical Efficiency	Solar Absorptivity α	Normal Emittance	$(\alpha-\eta)/\epsilon$	Temperature
Conventional (Pre-1976)	0.101	0.725	0.803	0.777	277
	0.101	0.725	0.843*	0.74	273.6
"Violet"	0.14	0.81	0.803	0.834	281.9
	0.14	0.81	0.843*	0.795	278.5
COMSAT Non-reflective (CNR)	0.155	0.906	0.803	0.935	290.1
	0.155	0.906	0.843*	0.891	286.6
* With cover slide ϵ = 0.843 (e.g., ceria-doped microcheet).					

IRAS data on the ANIKs and the WESTARs show good agreement with the model temperature. Satellite Business System Consortium of COMSAT, SBS-1 and -3 were reported to have only 10, instead of 20, 20-W RF power TWTs [24]. With the assumption that only about one-half the bus power was used, and the remaining power was reradiated at LWIR instead of RF, the CNR cell equivalent of η was one-half of 15%. The result is in good agreement with the observed temperature and the solar cell model, thus explaining the approximate 9° difference between the 295 K for the SBSs and the 286 K for the ANIKs and WESTARs.

The Galaxy 1 with K4 ¾ cells on the fixed upper cylinder and K7 on the deployable panel was modeled by averaging the properties of the old solar cell with the CNR cell properties from Table 10. The resulting model is within about 6 K of the IRAS measured temperature.

The good agreement found between the simple model and the IRAS measurements should not lead to the conclusion that the simple model is an adequate treatment of a very complex thermodynamic system. Rather, the neglected details, such as the antenna thermal flux and radiation from the open deployed cylinder, tend to compensate for one another.

TABLE 11
Physical Properties for HS-376 Cylinders

SSN	Satellite	Model Temp	IRAS Temp	Laboratory ϵ	IRAS ϵ	Laboratory α-η	IRAS (α-η)*
13431	ANIK D1	286.6	277.1	0.843	0.973	0.751	0.763
13652	ANIK C3	286.6	283.6	0.843	0.892	0.751	0.768
13069	WESTAR 4	286.6	281.4	0.843	0.891	0.751	0.744
13269	WESTAR 5	286.6	286.4	0.843	0.917	0.751	0.822
12065	SBS-1	293.7	296.9	0.843	0.728	0.828	0.747
13651	SBS-3	293.7	294.5	0.843	0.818	0.828	0.815
14158	Galaxy 1	280.1	278.5	0.843	0.836	0.688	0.670

* (α-η) is tabulated as α in Table 9 IRAS measurement.

The previous analysis concentrated on IRAS detections of the eight HS-376 spin-stabilized cylinders. The moderate consistency of flux densities and temperatures encouraged analysis of the remaining observations of spin-stabilized cylinders. Table 12 gives some physical information about many of the satellites in orbit during IRAS observations as well as the spin-stabilized cylinders observed: size, weight, electrical power, type, name, and manufacturer. Table 13 gives the observed flux densities—uncorrected for color temperature—and the calculated temperatures, emissivities, and absorptivities. All other observed cylinders had smaller projected areas than the HS-376 class, and almost all the reported flux densities were smaller than those for the HS-376s. Two INTELSAT 4s (4881 and 6052) and three INTELSAT 4As (8620, 10557, and 10778) were observed to have temperatures between 291 and 298 K, with a mean near 295 K. Both classes, HS-312 and HS-381, have approximately the same projected area.

TABLE 12
Payloads Detected by IRAS

Sid	Mass (kg)	Power (W)	Height (m)	Diameter (m)	A1	Remarks	Manufacturer	Name
573	80.0			.86	.581			TELSTAR 2 (A-41)
1361	35.2			1.13	1.003			LCS 1
2608	352.0		1.45	1.42	2.059	Gravity Stabilized		ATS 1
3029	365.0		1.83	1.42	2.599	Gravity Stabilized		ATS 3
3431	180.5	220	1.66	1.22	2.044			LES-6
4353	117.0		.81	1.37	1.110			NATO 1
4478	152.0		1.04	1.42	1.477		TRW	INTELSAT 3 F-8
4881	732.0	569	2.82	2.39	6.740	2.45-m antenna	Hughes 312	INTELSAT 4 F-2
4902	129.0		.81	1.37	1.110			NATO 2
6052	732.0	569	2.82	2.39	6.740	2.45-m antenna	Hughes 312	INTELSAT 4 F-5
6278	295.0	300	1.52	1.83	2.782		Hughes	ANIK A1 (TELESAT-1)
6437	295.0	300	1.52	1.83	2.782		Hughes	ANIK A2 (TELESAT-2)
7250	305.0	300	1.60	1.90	2.040	1.5-m antenna	Hughes 333	WESTAR 1
7790	295.0	300	1.52	1.83	2.782		Hughes	ANIK A3 (TELESAT-3)
8366	243.0		2.30	1.90	2.560		Philco Ford	GOES 1 (SMS-C)
8620	732.0	600	2.82	2.39	6.740	2.45-m antenna	Hughes 353	INTELSAT 4A F-2
8820	407.0			.60	.283			LAGEOS I
8838	791.0		2.82	2.44	6.897	3.38-m antenna	Hughes 351	COMSTAR 1
8882								MARISAT 2
9009	305.0	300	1.90	1.90	3.610	1.5-m antenna	Hughes	PALAPA 1
9047	791.0		2.82	2.44	6.897	3.38-m antenna	Hughes 351	COMSTAR 2
9478	330.0	330	2.42	1.90	3.450	1.65-m antenna	Hughes 356	MARISAT 3
9852	130.0		.82	1.40	1.148		NASDA	KIKU 2 (ETS-2)
10061	243.0		2.30	1.90	4.370		Philco Ford	GOES 2
10143	290.0	225	3.45	2.15	3.350		Hughes	HIMAWARI (GMS-1)
10557	732.0	600	2.82	2.39	6.740	2.45-m antenna	Hughes 353	INTELSAT 4A F-3
10778	732.0	600	2.82	2.39	6.740	2.45-m antenna	Hughes 353	INTELSAT 4A F-6
11153	474.0		2.14	2.17	4.644			ANIK B1 (TELESAT-4)
11715	130.0		1.40	.95	1.330	lost contact on injection	Mitsubishi	AYAME 2 (ECS-2)
11964	396.0		3.50	2.16	3.350		Hughes 371	GOES 4

TABLE 12 (Continued)
Payloads Detected by IRAS

Sid	Mass (kg)	Power (watts)	Height (m)	Diameter (m)	A1	Remarks	Manufacturer	Name
12065	550.0	1100	4.78	2.16	8.600	1.82-m antenna	Hughes 376	SBS 1
12295	640.0		2.80	2.10	5.880		NASDA	KIKU 3 (ETS-4)
12309	791.0		2.82	2.44	6.897	3.38-m antenna	Hughes 351	COMSTAR 4
12677	290.0	225	3.45	2.15	3.350		Hughes	HIMAWARI 2 (GMS-2)
13069	653.0	1000	4.78	2.16	7.800	1.82-m antenna	Hughes 376	WESTAR 4
13269	653.0	1000	4.78	2.16	7.800	1.82-m antenna	Hughes 376	WESTAR 5
13431	660.0	900	4.78	2.18	8.600	1.65-m antenna	Hughes 376	ANIK D1 (TELESAT-6)
13651	550.0	1100	4.78	2.16	8.600	1.82-m antenna	Hughes 376	SBS 3
13652	632.0	1135	4.78	2.18	8.600	1.65-m antenna	Hughes 376	ANIK C3 (TELESAT-5)
13782	350.0		3.20	2.18	6.976	0.31-m antenna	Mitsubishi	SAKURA 2A (CS-2A)
14050	396.0		3.50	2.16	7.560		Hughes 371	GOES 6
14134	630.0		5.00	2.16	8.600	1.83-m antenna	Hughes 376	PALAPA B1
14158	633.0	1000	4.78	2.16	8.600	2.05-m antenna	Highes 376	GALAXY 1

TABLE 13
IRAS Detections of Spin-Stabilized Cylinders

Sid	Name	$f_{12\mu}$	$f_{25\mu}$	$f_{60\mu}$	range	A_p	$T_{\epsilon=\alpha}$	$\frac{f_{12\mu}}{f_{25\mu}}$	$T_{12/25}$	$\frac{\dot{f}_{12\mu}}{\dot{f}_{25\mu}}$	$T^*_{12/25}$	$\epsilon_{12\mu}$	$\epsilon_{25\mu}$	$\epsilon_{60\mu}$	α
2608	ATS 1	0.5850	0.3550	0.0000	36000	2.06	295.0	1.6479	489.50	1.9133	489.19	0.158	0.157	0.000	1.197
3029	ATS 3	0.6470	0.6480	0.2900	36000	2.60	295.0	0.9985	343.83	1.2287	342.50	0.474	0.470	0.650	0.862
3431	LES 6	0.3750	0.2800	0.0000	36000	1.72	295.0	1.3393	416.02	1.6059	416.52	0.203	0.202	0.000	0.809
4353	NATO 1	1.0600	0.5450	0.0000	36000	1.11	295.0	1.9450	573.53	2.1987	571.93	0.342	0.339	0.000	4.828
4478	INTELSAT3 F8	2.5180	2.5500	1.0550	36000	1.48	295.0	0.9875	341.57	1.2161	340.23	3.334	3.307	4.200	5.898
4881	INTELSAT4 F2	2.1080	2.7730	1.1980	36000	6.74	295.0	0.7602	295.13	0.9553	295.30	1.108	1.099	1.292	1.112
4902	NATO 2	0.6450	0.7900	0.3400	36000	1.11	295.0	0.8165	306.46	1.0181	305.82	1.764	1.750	2.113	2.038
6052	INTELSAT4 F5	1.9670	2.6630	1.0970	36000	6.74	295.0	0.7386	290.91	0.9325	291.52	1.095	1.087	1.206	1.045
6278	ANIK A1	3.4650	4.8500	1.5800	36000	2.78	295.0	0.7144	286.09	0.9037	286.76	5.037	4.997	4.325	4.498
6437	ANIK A2	2.2250	3.3100	1.5100	36000	2.78	295.0	0.6722	277.69	0.8519	278.27	3.716	3.686	4.343	2.942
6974	DSCS 4	1.0520	1.3890	0.5870	36000	5.00	295.0	0.7574	294.58	0.9523	294.81	0.751	0.745	0.856	0.749
7250	WESTAR 1	0.7590	0.7470	0.3640	36000	2.04	295.0	1.0161	347.45	1.2488	346.14	0.680	0.675	1.023	1.289
7790	ANIK A3	0.5200	1.0600	0.6000	36000	2.78	295.0	0.4906	240.95	0.6222	241.00	1.775	1.761	2.186	0.791
8366	GOES 1	0.7560	0.7040	0.5350	36000	2.56	295.0	1.0739	359.31	1.3145	358.25	0.473	0.469	1.139	1.029
8620	INTELSAT4AF2	1.7350	2.2400	0.6050	36000	6.74	295.0	0.7746	297.95	0.9704	297.81	0.878	0.871	0.645	0.912
8838	COMSTAR 1	1.8800	1.8850	1.2050	36000	6.90	295.0	0.9973	343.60	1.2274	342.27	0.521	0.516	1.018	0.943
8882	MARISAT 2	0.8430	1.0820	0.6340	36000	3.45	295.0	0.7791	298.85	0.9751	298.60	0.823	0.817	1.314	0.864
9009	PALAPA 1	0.9600	0.7500	0.0000	36000	3.61	295.0	1.2800	401.90	1.5448	403.59	0.277	0.274	0.000	0.969
9478	MARISAT 3	0.8270	1.1460	0.6600	36000	3.45	295.0	0.7216	287.53	0.9125	288.21	0.947	0.940	1.444	0.863
9852	KIKU 2	0.3300	1.2100	0.0000	36000	1.15	295.0	0.2727	192.37	0.3367	192.38	10.004	9.924	0.000	1.809
10061	GOES 2	0.7420	0.9220	0.3600	36000	2.56	295.0	0.8048	304.06	1.0045	303.52	0.909	0.902	0.981	1.019
10143	HIMAWARI	0.7380	0.8950	0.4690	36000	3.35	295.0	0.8246	308.13	1.0277	307.43	0.654	0.649	0.958	0.771
10557	INTELSAT4AF3	1.7160	2.2110	1.0560	36000	6.74	295.0	0.7761	298.26	0.9720	298.08	0.865	0.858	1.124	0.901
10778	INTELSAT4AF6	1.8800	2.5370	1.0960	36000	6.74	295.0	0.7410	291.38	0.9351	291.94	1.040	1.032	1.202	0.998
11144	DSCS 11	1.1460	1.2850	0.5890	36000	5.00	295.0	0.8918	321.94	1.1059	320.82	0.568	0.564	0.756	0.795
11145	DSCS 12	1.6350	1.9940	0.9590	36000	5.00	295.0	0.8200	307.18	1.0222	306.52	0.983	0.975	1.319	1.146
11715	AYAME 2	0.1800	0.7600	0.0000	36000	1.33	295.0	0.2368	183.29	0.2891	183.39	6.398	6.347	0.000	0.955
11964	GOES 4	0.7140	0.9000	0.5480	36000	3.35	295.0	0.7933	301.71	0.9910	301.27	0.691	0.685	1.155	0.751
12065	SBS 1	1.8610	2.4200	1.1990	36000	8.84	295.0	0.7690	296.86	0.9645	296.84	0.728	0.723	0.979	0.747
12295	KIKU 3	0.6250	0.6730	0.4500	36000	3.75	295.0	0.9287	329.50	1.1485	328.24	0.376	0.373	0.744	0.577
12309	COMSTAR 4	1.9670	2.6850	1.1590	36000	6.90	295.0	0.7326	289.72	0.9259	290.42	1.089	1.080	1.252	1.023
12677	HIMAWARI 2	0.6160	0.7400	0.4150	36000	3.35	295.0	0.8324	309.74	1.0368	308.99	0.534	0.530	0.841	0.643
13069	WESTAR 4	1.5920	2.3040	1.0130	36000	7.80	295.0	0.6910	281.39	0.8749	282.04	0.891	0.884	1.017	0.744
13269	WESTAR 5	1.7770	2.4820	1.0180	36000	7.80	295.0	0.7160	286.39	0.9055	287.06	0.917	0.910	0.992	0.822
13431	ANIK D1	1.8310	2.7370	1.1350	36000	8.84	295.0	0.6690	277.06	0.8480	277.63	0.973	0.965	1.031	0.763
13651	SBS 3	2.0250	2.6750	1.2450	36000	8.84	295.0	0.7570	294.51	0.9519	294.74	0.818	0.812	1.027	0.815
13652	ANIK C3	1.8710	2.6660	0.9990	36000	8.84	295.0	0.7018	283.56	0.8882	284.22	0.892	0.885	0.874	0.768
13782	SAKURA 2A	0.9210	1.1920	0.0000	36000	3.57	295.0	0.7727	297.58	0.9684	297.47	0.884	0.877	0.000	0.914
14050	GOES 6	0.7320	0.8030	0.5650	36000	3.35	295.0	0.9116	325.99	1.1288	324.79	0.515	0.511	1.063	0.757
14134	PALAPA B1	1.5150	2.6400	0.9800	36000	8.84	295.0	0.5739	258.14	0.7307	258.59	1.134	1.125	1.000	0.670
14158	GALAXY 1	1.6130	2.3850	1.0350	36000	8.84	295.0	0.6763	278.49	0.8570	279.10	0.836	0.829	0.933	0.670

The three INTELSAT 4A satellites with nearly equal flux densities, absorptivities, and temperatures were selected as a baseline for estimating the projected area and solar power from the 12-μ flux density. The mean value for $J_{12\mu} = 1.777$ establishes $A_p = 6.74/1.777\ m^2/J_{12\mu}$. Using projected solar cell area, $A_p = 6.74\ m^2$, the mean ϵ is computed to be 0.928, and the mean α is 0.937. Thus, the α/ϵ is very close to unity, and the observed temperature, 295.9 K, is very close to that of the free-space cylinder model, which is 295 K. The INTELSAT 4A series provides a better baseline than the newer HS-376 because the analysis is simplified: the INTELSAT series did not use the new K7 high-efficiency solar cells. Table 14 gives the COMSAT model temperature for the INTELSAT 4 solar panels.

TABLE 14
INTELSAT 4A Model Temperature

		Summer Solstice	Winter Solstice	Equinox	Eclipse
Solar Power	FWD	287 K	290 K	295 K	220 K
	AFT	283 K	290 K	293 K	194 K
Sun Shield	DISC	285 K	255 K	269 K	233 K
	CONE	264 K	244 K	254 K	222 K
TWT Power Supply		309 K	312 K	308 K	283 K
		310 K	314 K	309 K	276 K

Figure 14 plots the measured (uncolor corrected) 12-μ flux vs. A_p for the cylinders observed (from the data in Table 13). Also shown are parameter lines for $\epsilon = 1.0$ and 0.5, which are valid for temperatures near 295 K. Note that most of the satellites fall between $\epsilon = 1.0$ and 0.75, although several satellites, smaller than 3 m^2, give flux densities above the $\epsilon = 1$ parameter line. Since ϵ cannot exceed unity, the implication is that additional satellite surface area is contributing observable flux. This could be the antenna or a top-of-the-cylinder optical solar radiator. Equally likely is that the sum of the small signal and the space background yields excessive flux observations. The fact that many more objects are above the unity parameter line than below suggests that the SNR alone is not the cause. The detection threshold level, 0.15 Jy, is also shown on Figure 14. One of the smallest satellites, Ayame 2, about 1.2 m^2, has a

12-μ flux slightly greater than the threshold. Most of the satellites smaller than a few square meters yielded only one of two detections compared to more than a dozen for the largest. Some large cylinders also have few or a single detection such as COMSTAR 2, $A_p = 6.9\ m^2$, which appears to yield inaccurate results, e.g., $T = 8000$ K!

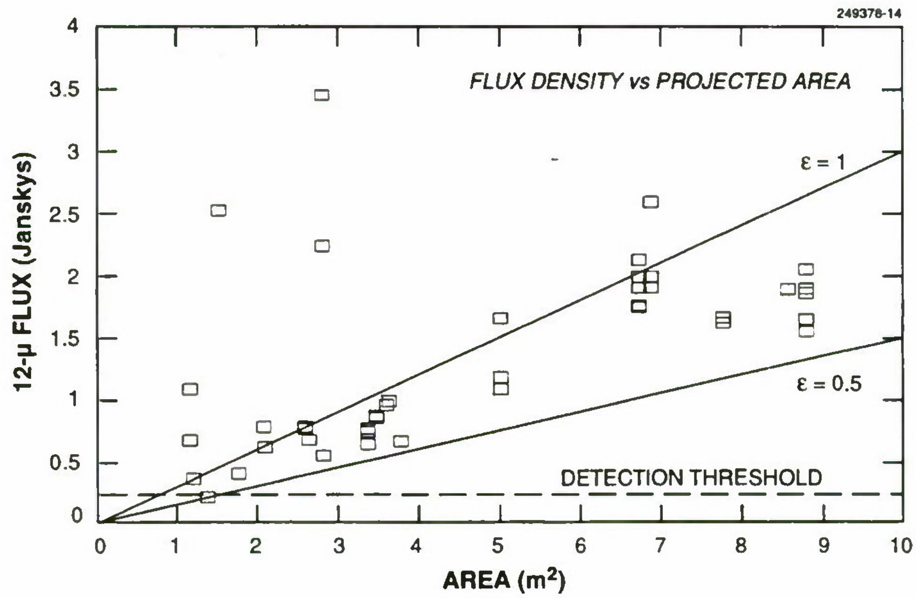

Figure 14. Flux density vs. projected area.

As might be expected, the temperature measurement suffers greatly with small flux densities and small samples. Recall the formal flux density uncertainty in the 12-μ HS-376 flux data is 0.6 Jy. Figure 15 plots calculated temperature vs. the projected solar cell area for the cylinders observed. Almost all of the largest satellites are at or below 300 K. For smaller cylinders, the temperature deviation from 300 K increases. Arrows are shown for 10%, 20%, 30%, and 50% change in the J12/J25 flux ratio. Above several square meters, most satellites are close to or somewhat below 295 K.

The projected area of a geostationary spin-stabilized satellite, as well as the solar power, can be estimated directly from the flux density. The 12-μ flux (uncolor corrected) is multiplied by a constant for area and a constant for power. The values of the constants for satellites of the INTELSAT 4, 4A epoch and earlier are given in Table 15. Values for power estimation are shown for beginning of life (BOL) as well as end of life (EOL). The solar power is based on 520 W available at EOL, which is seven years. Values are also given for the HS-376 class and for the somewhat different Hughes Galaxy 1.

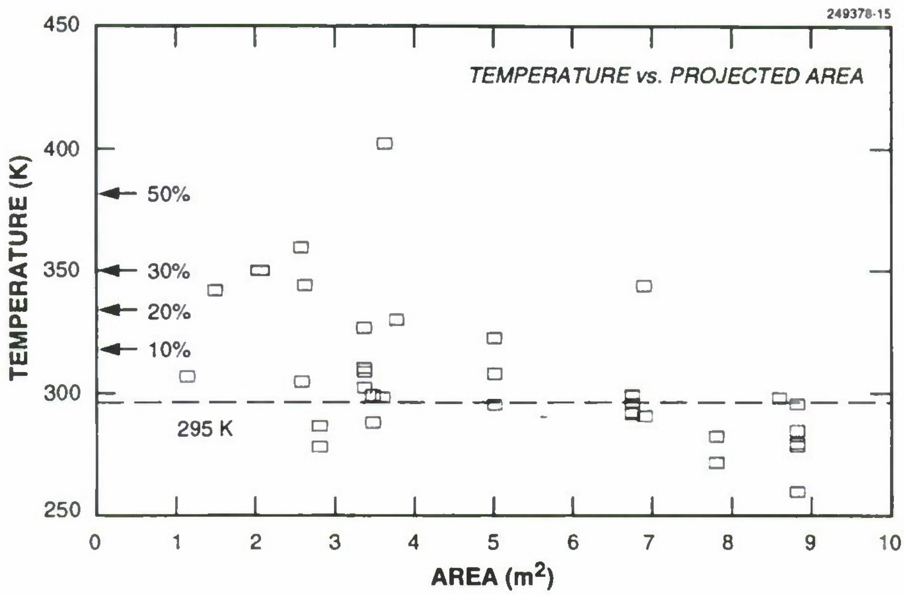

Figure 15. Temperature vs. projected area.

TABLE 15
Estimators for Geosynchronous Area and Power

	Older Cells INTELSAT 4,4A	HS-376 K7 Cells	Galaxy 1 K4¾ & K7 Cells
Area/$J_q^{12\mu}$	3.79 m^2/Jy	4.65 m^2/Jy	5.48 m^2/Jy
BOL Power/$J_q^{12\mu}$	365 W/Jy	512 W/Jy	614 W/Jy
EOL Power/$J_q^{12\mu}$	292 W/Jy	410 W/Jy	491 W/Jy

Table 16 applies the simple flux density relationship to a number of satellites including Lincoln LES-6 (3431), launched in 1968. The area and power estimates for the GOES satellites 1, 2, 3, and 4 are also given together with the Japanese Himawari 1 and 2. (All are components of the global Earthwatch weather system that forecasters display on television.) GOES 1 and synchronous meteorological satellite (SMS-3) are the series built by Philco Ford for NASA before Hughes began the GOES series. The area

calculated for Table 16 agrees with the drawings: the power estimate has not been verified. Both COMSAT and MARISAT appear to yield good power and area agreement. COMSTAR may have some new solar cells that yield additional power.

Most of the smaller cylinders are older than the INTELSAT 4 series and should be near the 300-K temperature. If there is no automatic shutdown, power on the order calculated may still be available since the degradation rate is slowed after ten years (5% in the first year, 18% after ten years).

TABLE 16
Geosynchronous Area and Power Estimation

		Projected Area (m^2)		Power (W)	
Satellite	$J_y^{12\mu}$	**IRAS**	**Drawing**	**IRAS**	**Referenced**
LES-6 3431	0.375	1.43	1.72	110	220 BOL 190 1 Yr
GOES 1 8366	0.756	2.87	2.56	221	*
GOES 2 10061	0.742	2.82	2.54	216	*
GOES 4 11964	0.714	2.71	3.35	209	*
GOES 6 14050	0.732	2.78	3.35	214	*
Himawri1 10143	0.738	2.80	3.35	214	225
Himawri2 12677	0.616	2.34	2.35	180	225
COMSTAR 4 12309	1.97	7.47	6.9	575	760 BOL 608 7Yr
Marisat 3 8882	0.882	3.35	3.45	258	220 BOL 264 EOL
Marisat 2 9478	0.827	3.14	3.45	242	220 BOL 264 EOL
* Not found					

Two important thresholds exist for space surveillance. The first, and lower, is the minimum signal required for detection for a metric position measurement. The second, requiring greater signal strength, is the threshold for useful, repeatable space object information such as emissivity area product and temperature. The data in Table 13 shows that cylinders smaller than about 3 m^2 usually exhibit flux densities below 0.6 Jy, the formal uncertainty determined in the HS-376 analysis. Low flux densities correspond to low SNRs, hence derived temperatures far from 300 K and emissivities near 0 or greater than 1, and unlikely values for α.

The demonstrated IRAS geosynchronous satellite threshold is slightly below 1 m^2. The threshold for repeatable space object information appears to be slightly above the 3-m^2 cylinder projected area corresponding to about 0.5 Jy. However, the information threshold is strongly dependent on the number of observations.

10. ROCKET BODIES

There are 668 IRAS detections of rocket bodies. The common denominator among rocket bodies is their white paint (TiO_2) covering, which helps to maintain a low temperature while on the launch pad. As discussed in Section 3, the low temperature results from the small value of $\alpha/\epsilon = 0.22$ for TiO_2. The IRAS data on rocket bodies is represented in Figure 16, which displays the $f_{12\mu}/f_{25\mu}$ temperature plotted against the $f_{25\mu}/f_{60\mu}$ temperature for all individual hits. Figure 17 displays the 107 detections on satellites for which there were more than two detections ($n > 2$). There are three notable features. First is the large scatter in both temperatures. The scatter of these data is significantly greater than, say, the spin-stabilized cylinders. A contributing factor could be the slow passage across the focal plane ($\approx$ 10 sec) of a tumbling target. The change in projected area with time can introduce error in the deduced flux ratio. The extreme values are as low as 50 K and as high as 800 K. Second is the value of the median temperature (from the $n > 2$ data) $T(f_{12\mu}/f_{25\mu}) = 182$ K. One would expect $(\alpha/\epsilon)^{1/4} \times 295$ K $= 202$ K for a tumbling cylinder covered with TiO_2. This is consistent with the white paint covering. Third is the difference between $T(f_{12\mu}/f_{25\mu}) = 182$ K and $T(f_{25\mu}/f_{60\mu}) = 235$ K. The median temperatures for all the detections are 283 and 249 K, respectively. This suggests that the emissivity of white paint has some wavelength dependence. This is similar to the general result (Section 7), specifically with the results from spin-stabilized cylinders (Section 8), and the discussion in Section 4—but in the opposite sense. Finally, Figure 18 gives the temperature as a function of SSC number, and Figure 19 gives the same plot for satellites with more than two detections. This is the order of launch: smaller SSC numbers are associated with earlier launches. A change in the temperature is not apparent. Dow's suggested increase in α with time would result in higher temperatures for earlier launches. This is not observed in the IRAS data.

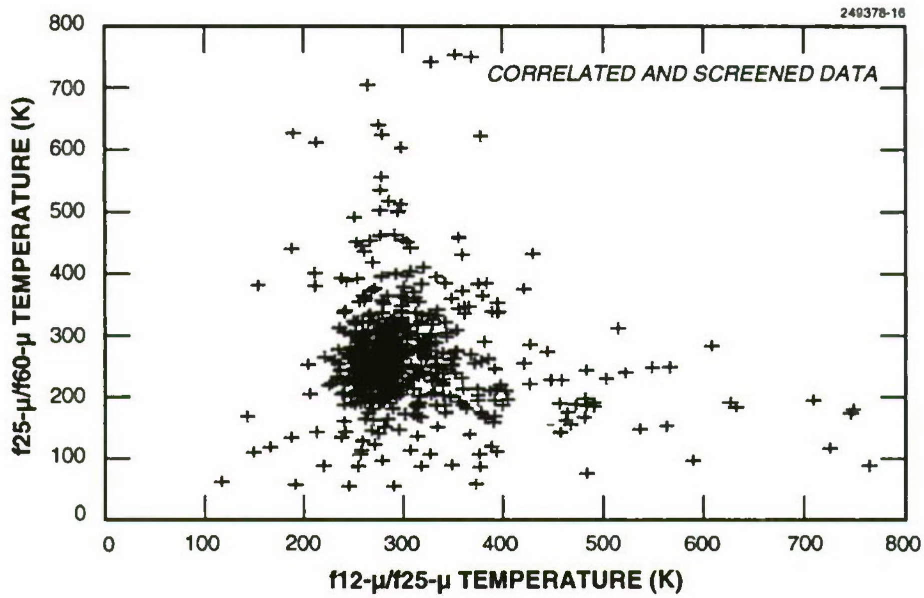

Figure 16. Rocket body temperatures.

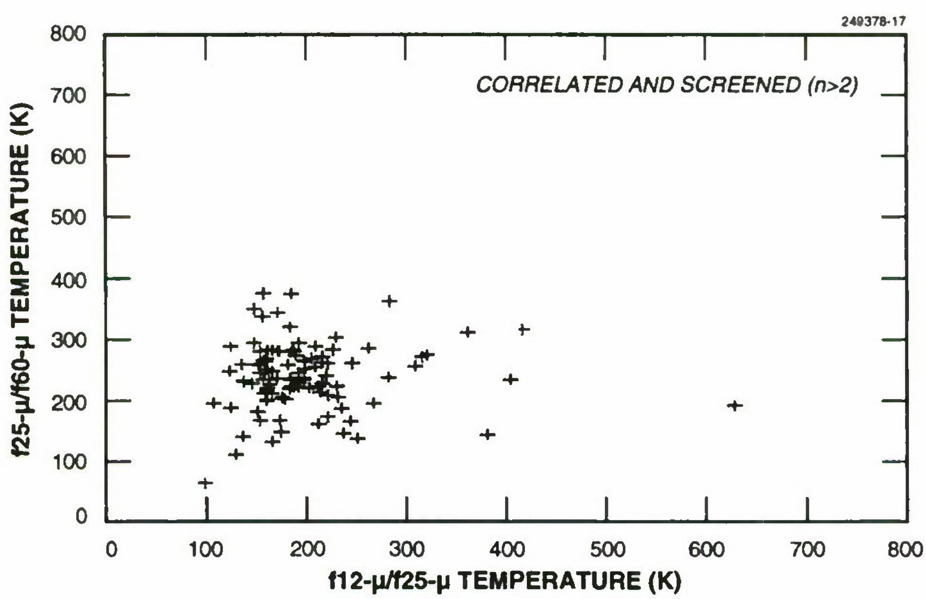

Figure 17. Rocket body temperatures, n > 2.

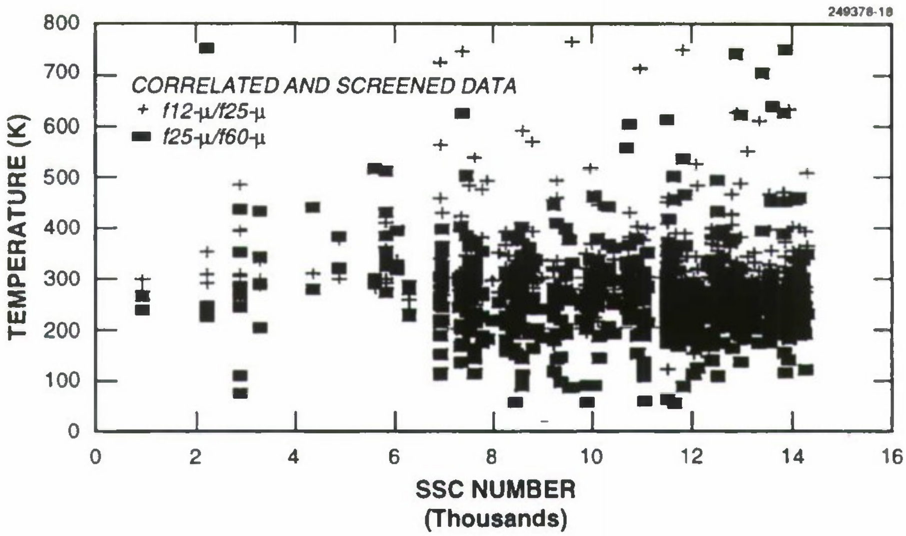

Figure 18. Rocket body temperature vs. SSC number.

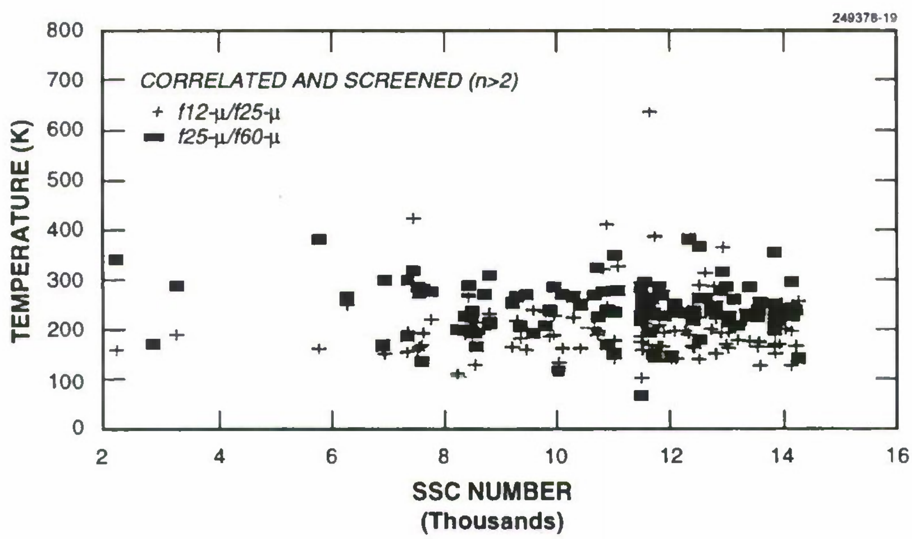

Figure 19. Rocket body temperature vs. SSC number, n > 2.

11. THREE-AXIS STABILIZED SATELLITES

11.1 GPS

The Global Positioning System (GPS) provides a means of determining position. These three-axis stabilized satellites are in 12-h circular orbits. The Block I series, Figure 20 [28], have solar panels furnishing 400 W of power and are in orbits with an inclination of 63.5°. The Block II series, Figure 21, have solar panels furnishing 700 W of power and are in orbits with an inclination of 56°.

The Block I solar panels are in the shape of a cylindrical section, whereas the Block II solar panels are flat. The satellite attitude is continuously adjusted so the antenna-populated side of the satellite is facing the earth, and the solar panel arrays are normal to the sun direction. For the Block I satellites, the earth-facing side has an area of $A_{\text{flat}} = 1.35\ \text{m}^2$, and the solar panels have a projected area of $A_{\text{solar}} = 5.28\ \text{m}^2$. To complete the model, assume the main body of a GPS satellite is cylindrical in shape. Therefore, the side silhouette is a rectangle of area $A_{\text{side}} = 1.6\ \text{m}^2$. Further, assume that this cylinder and flat solar panel model is a simple model that has no shadowing.

The IRAS satellite made 22 detections of five Block I satellites: SSC numbers 10684, 11054, 11141, 11690, and 11783. These measurements were made with sun-GPS-IRAS phase angles ranging from 78° to 120°. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 22 as a function of time. There are some significant outliers. The median temperature is 297 K and is preferred to the average to avoid a bias from the extreme values. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 23 as a function of phase angle. Except for three outliers, the temperature seems to be independent of phase angle. This suggests that the solar panels have the same temperature as the body. The reported 12-μ flux as a function of phase angle is plotted in Figure 24. A dependence of flux on phase angle is shown. Averaging groups of observations, one observes a minimum of 1.07 Jy at $\theta = 90.6°$, 1.57 Jy at $\theta = 101.8°$, raising to 2.71 Jy at $\theta = 120.8°$ and 1.72 Jy at $\theta = 81.3°$.

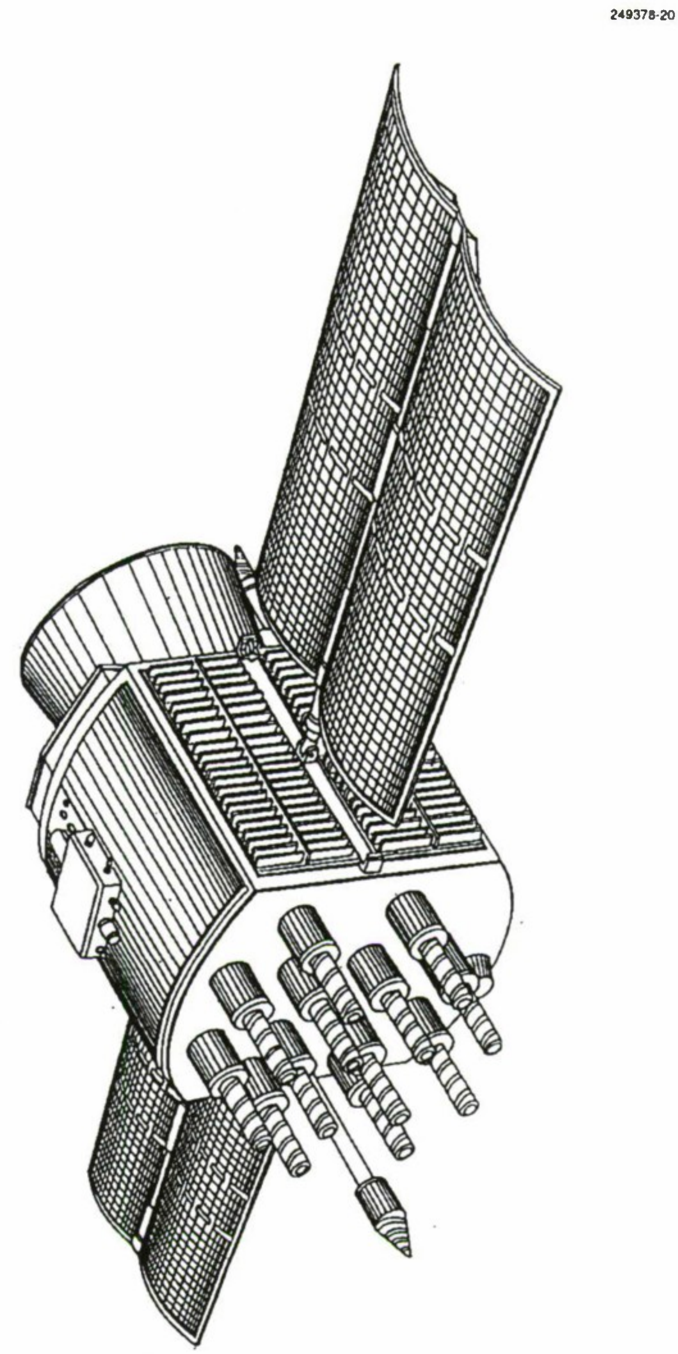

Figure 20. GPS Block I satellite.

249378-21

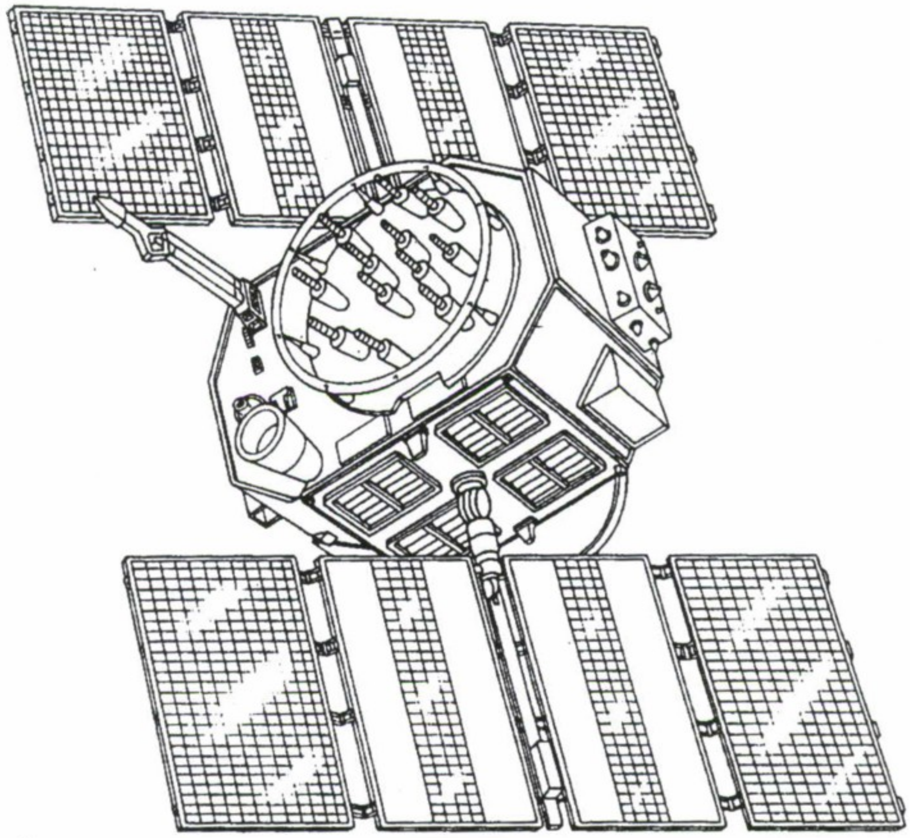

Figure 21. GPS Block II satellite.

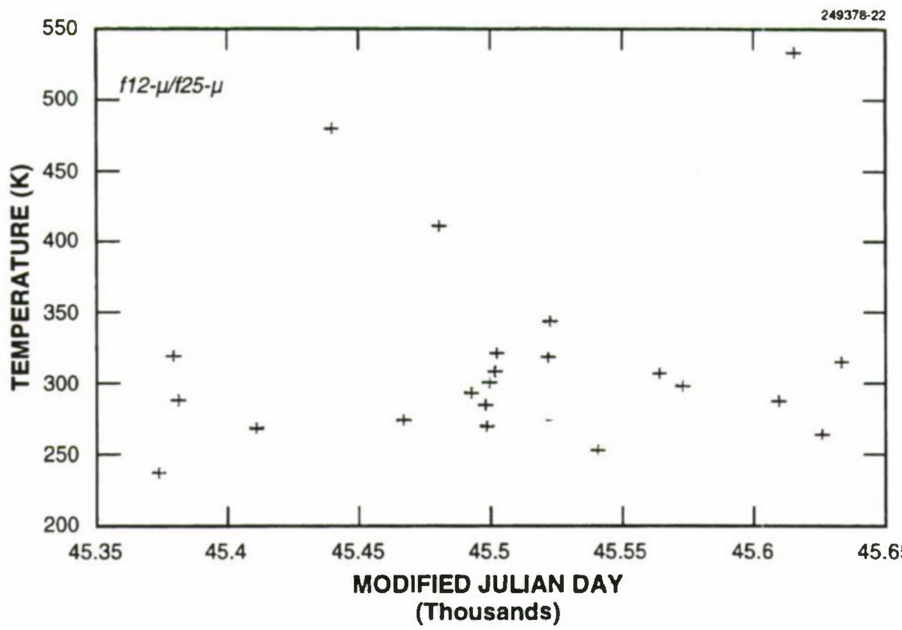

Figure 22. GPS temperature vs. date.

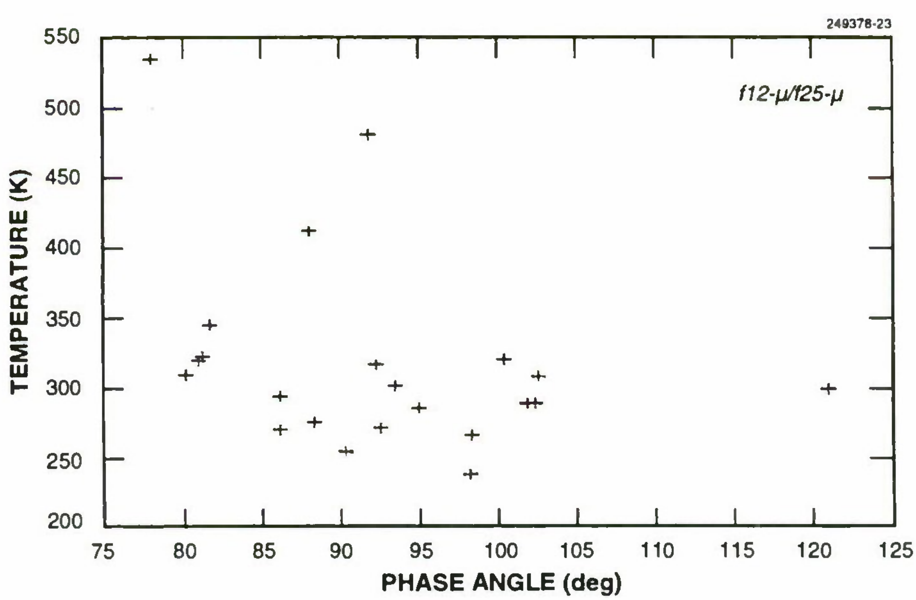

Figure 23. GPS temperature vs. phase angle.

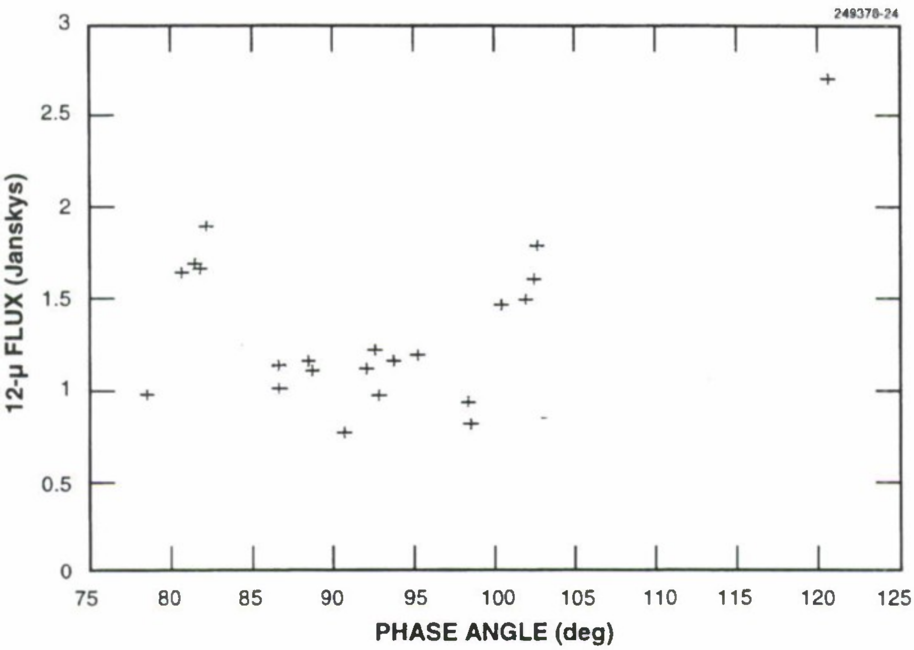

Figure 24. GPS 12-μ flux vs. phase angle.

As an illustration, the emissivity is calculated assuming the $\theta = 90^\circ$ data all from the earth-facing, 1.35 m^2 side of the GPS satellite is the only source of radiant energy. So the radiant flux density at 300 K is

$$\mathcal{F}_{12\mu}(298) = 27.39 \ W/\mu/(effective \ \epsilon A) \ .$$

The IRAS color correction adjusts the 90° value to

$$J_{obs}^{12\mu} = J_q^{12\mu}/K_{12\mu} = 1.07/0.92 = 1.163 \ Jy \ ,$$

which is equal to $F_{obs}{}^{12\mu} = 2.421 \times 10^{-14}$ W/($m^2\mu$). Now at a typical range of 19,000 km, the observed spectral radiation intensity is $\pi r^2 F_{obs}{}^{12\mu} = \pi(19.0 \times 10^6)^2(2.421 \times 10^{-14}) = 27.46$ W/μ. Therefore, the effective area ϵA is

$$\epsilon A = \frac{\pi r^2 F_{obs}^{12\mu}}{\mathcal{F}_{12\mu}(298)} = 1.0025 \ \ (m^2) \ .$$

Since the projected area is $A = 1.35\ m^2$, the emissivity of the flat, antenna-populated side is $\epsilon = 0.74$.

A more detailed model can be defined as follows. At phase angles $\theta \neq 90°$ and aspect angles $\phi \neq 0$, the solar panel and the satellite body, assumed cylindrical, will contribute to the observed flux. Now the cylinder and plate model will have the projection of the solar panel on the IRAS line of sight as $A_{solar}|\cos(\theta)|$. So if the cylinder flat end area is $A_{flat} = 1.35\ m^2$, the cylinder side projected area is $A_{side} = 1.6\ m^2$, and the solar panel area is $A_{solar} = 5.28\ m^2$, then the flux received would be

$$F_{obs}^{\lambda_o} = \frac{1}{\pi R^2}\left[\epsilon_{body}\left(A_{flat}\cos(\varphi) + A_{side}|\sin(\varphi)|\right)\mathcal{F}_{\lambda_o}(T_{body})\,\epsilon^{\pm}_{solar}A_{solar}|\cos(\theta)|\mathcal{F}_{\lambda_o}(T_{solar})\right],$$

where ϕ is the IRAS-GPS aspect angle. The back of the solar panel is observed at $\theta > 90°$ and the emissivity is ϵ^-; the front of the solar panel is observed at $\theta < 90°$ and the emissivity is ϵ^+. The illustrative calculation can be generalized to obtain the emissivity of the solar panels accounting for the phase angle, the aspect angle, and the range. The linear regression results are summarized in Table 17.

TABLE 17
Emissivity for GPS Satellites

θ	Element	A (m^2)	ϵ
=90	Body Flat	1.35	0.622±0.04
<90	Solar Cell Front	5.28	0.933±0.10
>90	Solar Cell Back	5.28	0.619±0.08

The emissivity for the solar panel front side, $\epsilon = 0.93 \pm 0.1$, is larger than expected. It depends directly on the adopted area. Based on laboratory measurements one expects emissivity values about 0.80. The spin-stabilized cylinders give values of solar cell emissivity between 0.6 and 0.7. The solar panel back and the main body have the same emissivity, $\epsilon = 0.62$. The two values are equal within the statistical uncertainty.

11.2 GORIZONT

The Gorizont satellites, for telephone and international television, were launched by the Soviet Union. Gorizont I (SSN 11158) has a 24-h period and was launched in 1978 into an orbit with 11.3°

inclination. By 1993 the inclination increased to more than 21°. The other Gorizont satellites are geosynchronous satellites in low inclination orbits.

The Gorizont is a three-axis stabilized satellite (see Figure 25) [28]. The main body is about 5 m long and 2 m in diameter. There are a number of appendages that will increase the effective area. Two panels of solar cells of unknown size provide power.

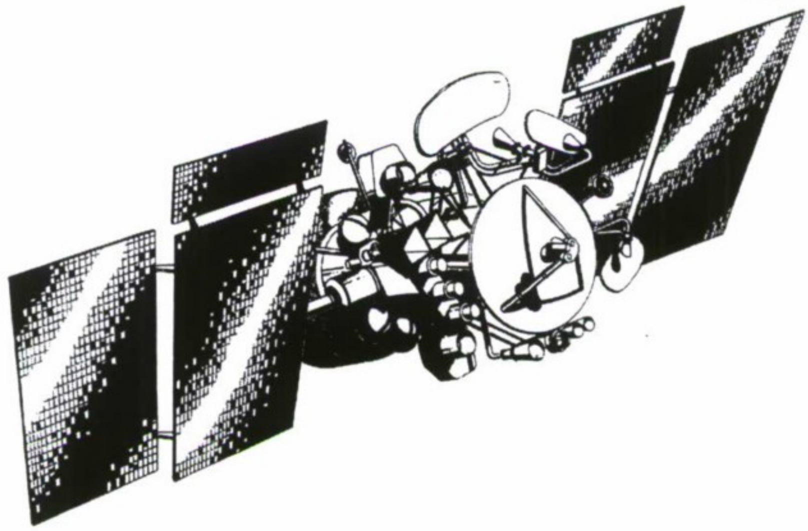

Figure 25. Gorizont satellite. (Used with permission. Donald H. Martin, Communication Satellites 1958–1992, ©1991, The Aerospace Corporation.)

The IRAS satellite made 26 detections of four Gorizont satellites: SSC numbers 11158, 11440, 13092, and 13624. These measurements were made with sun-Gorizont-IRAS phase angles ranging from 60° to 117°. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 26 as a function of time. The median temperature is 280 K and is preferred to the average to avoid a bias from the extreme values. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 27 as a function of phase angle. The trend is temperature independent of phase angle. This suggests that the solar panels have the same temperature as the body. The reported 12-μ flux as a function of phase angle is plotted in Figure 28. Here, a minimum of 1.3 Jy is observed at θ = 90°, raising to 2.2 Jy at θ = 80°, and 2.8 Jy at θ = 115°. Note also that none of the data for Gorizont I follow this trend. Therefore, it is not included in the following calculation.

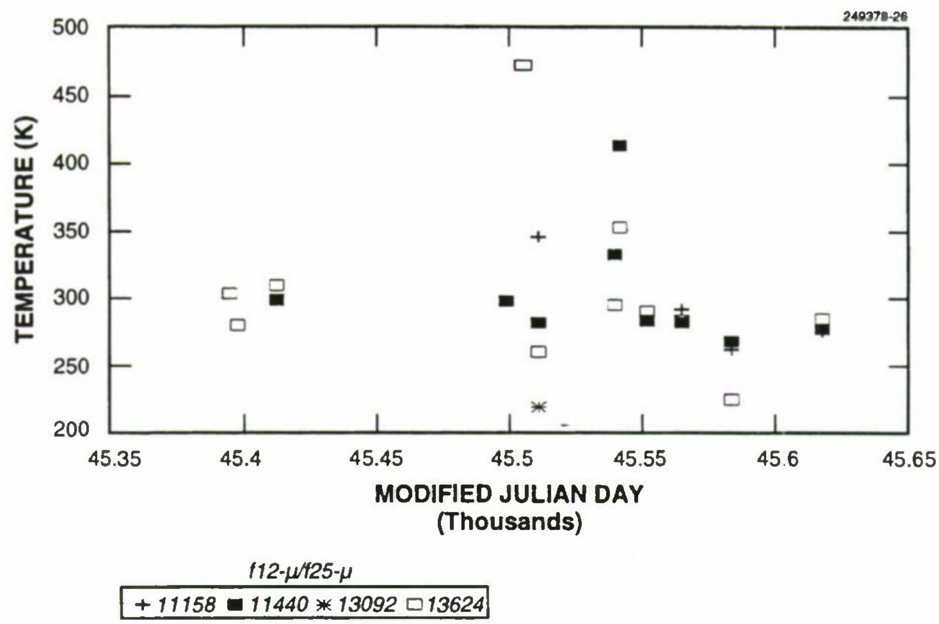

Figure 26. Gorizont temperature vs. date.

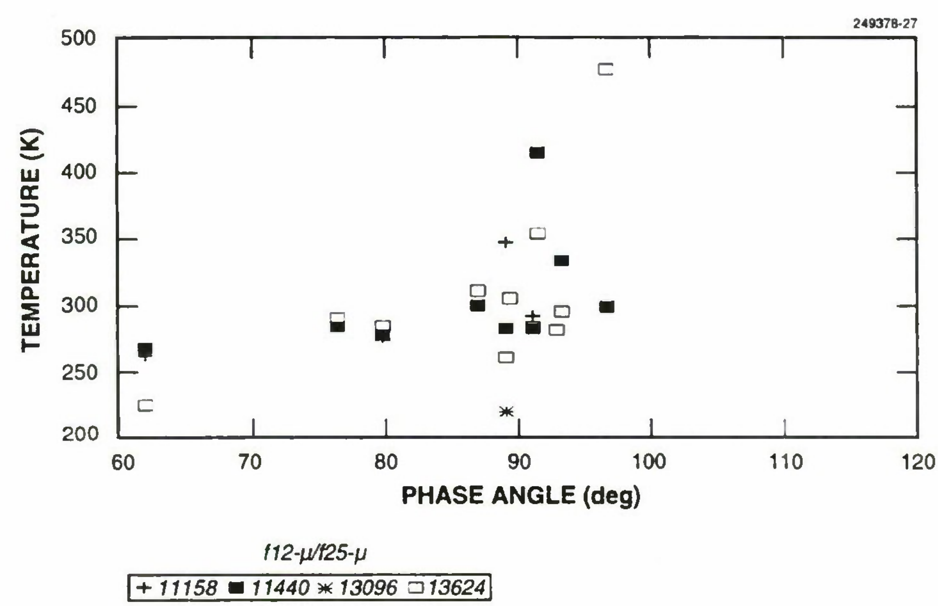

Figure 27. Gorizont temperature vs. phase angle.

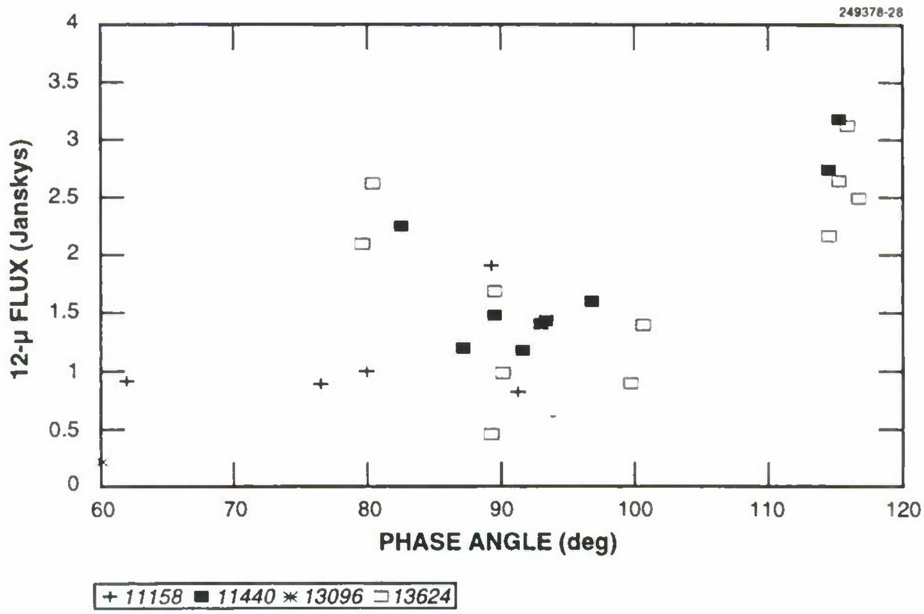

Figure 28. Gorizont 12-µ flux vs. phase angle.

Now the radiant flux density at 280 K is

$$\mathcal{F}_{12\mu}(280) = 21.06\ W/\mu/(effective\ \epsilon A)\ .$$

The IRAS color correction adjusts the 90° value to

$$J_{obs}^{12\mu} = J_{q}^{12\mu}/K_{12\mu} = 1.3/0.90 = 1.44\ Jy\ ,$$

which is equal to $F_{obs}{}^{12\mu} = 3.007 \times 10^{-14}$ W/(m$^2\mu$). Now at a range of 36,000 km, the observed spectral radiation intensity is $\pi r^2 F_{obs}{}^{12\mu} = \pi(36.0 \times 10^6)^2(3.007 \times 10^{-14}) = 122.4$ W/μ. Now the effective area ϵA is

$$\epsilon A = \frac{\pi r^2 F_{obs}^{12\mu}}{\mathcal{F}_{12\mu}(280)} = 5.81\ \ (m^2)\ .$$

In this case we chose to adopt a value of the emissivity, $\epsilon = 0.70$, and calculate the earth-facing area, which is $A = 8.3$ m^2. This is equivalent to a 3.2-m-diameter main body, which is 60% larger than the nominal main body dimension. We can estimate the size of the solar panels. Following the same

reasoning used for GPS (see Section 11.1), the projection of the solar panel on the IRAS line of sight is $A_{solar}|\cos(\theta)|$. So if the cylinder flat end area is A_{flat}, the cylinder side project area is A_{side}, and the solar panel area is A_{solar}, then the flux received would be

$$F_{obs}^{\lambda_o} = \frac{1}{\pi R^2}\left[\epsilon_{body}(A_{flat}\cos(\varphi) + A_{side}|\sin(\varphi)|)\mathcal{F}_{\lambda_o}(T_{body})\epsilon_{solar}A_{solar}|\cos(\theta)|\mathcal{F}_{\lambda_o}(T_{solar})\right],$$

where ϕ is the IRAS-Gorizont aspect angle. The back of the solar panel is observed at $\theta = 115°$, and the front is observed at $\theta = 80°$. The same regression calculation can be done. Since we have no prior knowledge of the solar plane area, we chose to determine the emissivity area product ϵA. The results are summarized in Table 18.

TABLE 18
Emissivity Area for Gorizont Satellites

θ	Element	εA (m²)	A (m²)
=90	Body Flat	4.38±0.6	6.25
<90	Solar Cell Front	30.75±6.8	33
>90	Solar Cell Back	15.50±2.2	25

This estimate of the earth-facing area, $\epsilon A = 4.38$, leads to an area $A = 6.25$ m^2, equivalent to a main body diameter of 2.8 m, which is about 40% larger than the nominal. The estimates of the panel size from the front and back emissions differ due to measurement error, model error, and above all, error in the adopted emissivity. Based on the GPS results one might expect the back panel emissivity to be lower by 30% to 50%. If we adopt the GPS values of emissivity from the body and solar cells, then we get values given in Table 18. The solar panel area is of the order of 25 to 35 m^2. This is consistent with two solar panels, each providing 1 to 2 kW of power.

11.3 RADUGA

The Raduga satellites were the first Soviet satellites in geosynchronous orbit. They were three-axis stabilized and were used for telephone, telegraph, and television transmission. The characteristics are

similar to the Gorizont satellites (Section 11.2). The IRAS satellite made 27 detections of six Raduga satellites: SSC numbers 10159, 10987, 11708, 12897, 13669, and 13974. These measurements were made with the sun-Raduga-IRAS phase angle ranging from 84° to 103°. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 29 as a function of time. These measurements were made with sun-Raduga-IRAS phase angles ranging from 76° to 103°. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 30 as a function of phase angle. The median temperature is 288 K and is preferred to the average to avoid a bias from the extreme values. The trend is temperature independent of phase angle. This suggests that the solar panels have the same temperature as the body. The reported 12-μ flux as a function of phase angle is plotted in Figure 31. The same regression calculation that was done for GPS and Gorizont satellite data can be done. Since there is no prior knowledge of the solar plane area, we determined the emissivity area product ϵA. The results are summarized in Table 19.

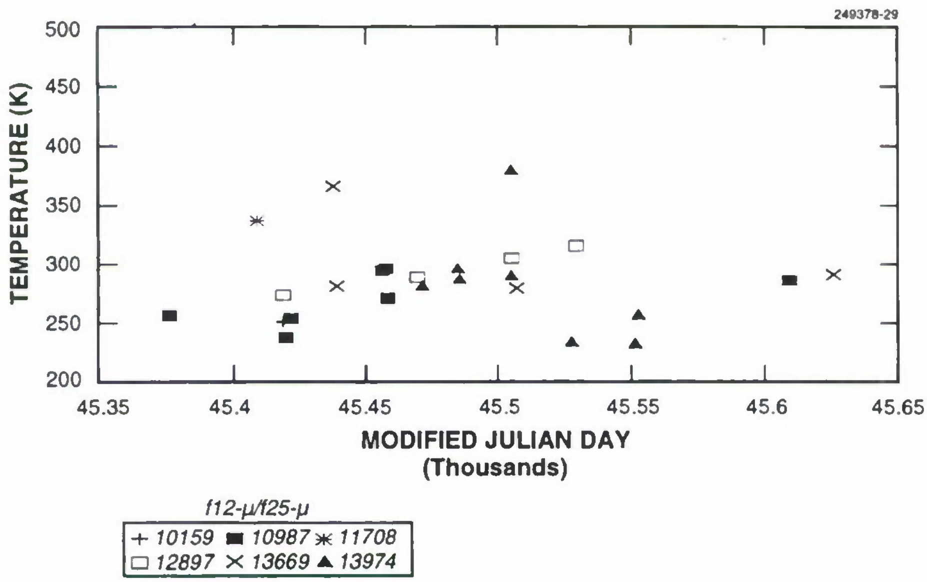

Figure 29. Raduga temperature vs. date.

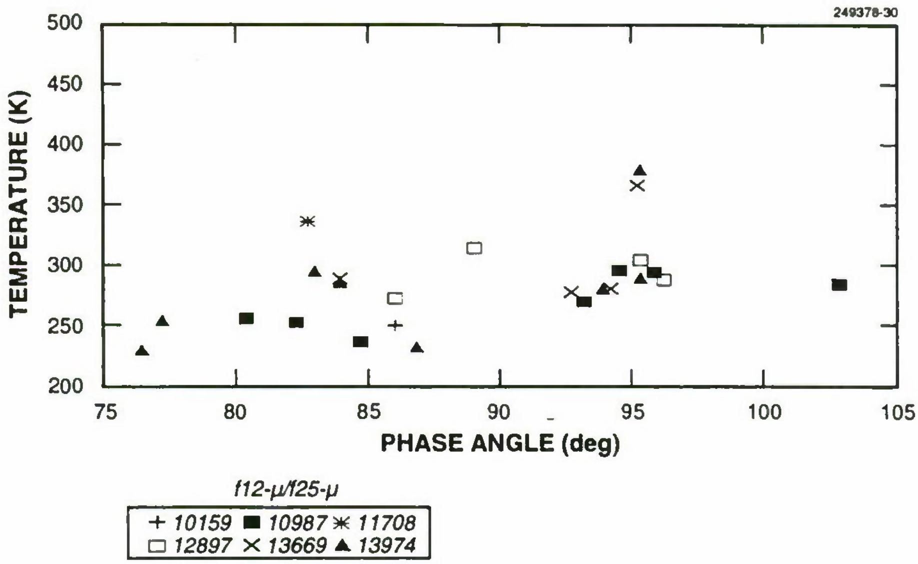

Figure 30. Raduga temperature vs. phase angle.

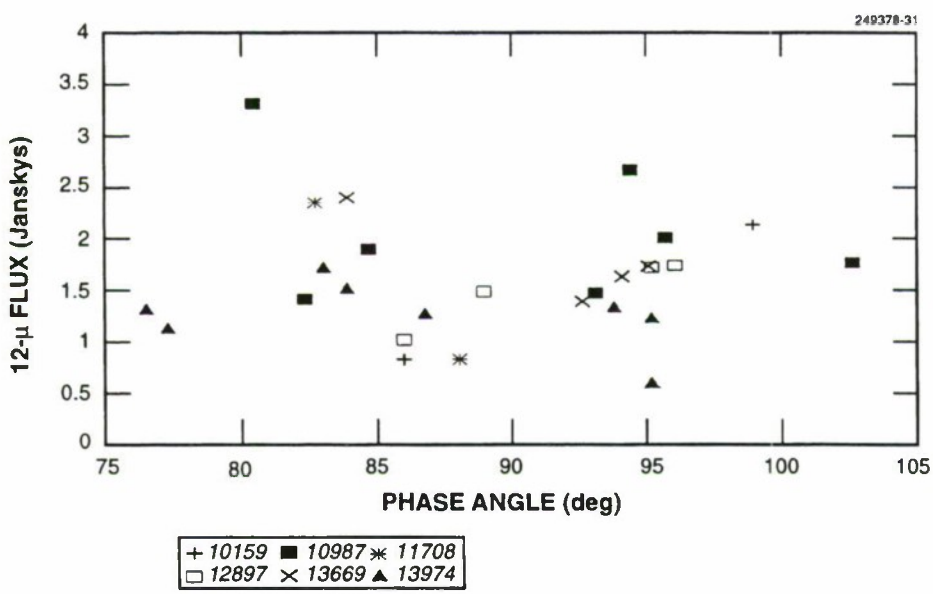

Figure 31. Raduga 12-μ flux vs. phase angle.

TABLE 19
Emissivity Area for Raduga Satellites

θ	Element	ϵA (m^2)	A (m^2)
=90	Body Flat	2.80±1.4	4.00
<90	Solar Cell Front	37.13±14.4	40
>90	Solar Cell Back	36.44±16.4	58

This estimate of the earth-facing area, $\epsilon A = 2.8$ m^2, leads to an area $A = 4$ m^2, which is equivalent to a main body diameter of 2.25 m. There is no prior knowledge of the body size. The estimates of the panel size from the front and back emissions differ due to measurement error, model error, and above all, error in the adopted emissivity. Based on the GPS results one might expect the back panel emissivity to be lower by 30% to 50%. However, the ϵA product for the front and back are nearly equal. Nevertheless, uncertainty is quite large. If the GPS values of emissivity from the body and solar cells are adopted, then values for A are as given in Table 18. The solar panel area is larger than 35 m^2. This is consistent with two solar panels, each providing 1 to 2 kW of power.

11.4 EKRAN

The Ekran satellites were three-axis stabilized and were used for telephone, telegraph, and television transmission within the USSR and bordering countries. The characteristics are similar to the Gorizont satellites (Section 11.2), Figure 32 [28], with the addition of a complex antenna array on the earth-facing side of the satellite. The IRAS satellite made 27 detections of five Ekran satellites: SSC numbers 11273, 12120, 12564, 13554, and 13878. These measurements were made with the sun-Ekran-IRAS phase angle ranging from 70° to 97°. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 33 as a function of time. Temperatures determined with the $f_{12\mu}/f_{25\mu}$ flux ratio are plotted in Figure 34 as a function of phase angle. The median temperature is 284 K and is preferred to the average to avoid a bias from the extreme values. There is a suggestion of an increase in temperature for phase angles greater than 90°. The reported 12-μ flux as a function of phase angle is plotted in Figure 35. The temperature measurements are consistent with those of other satellites. However, there seems to be no simple relation between phase angle and flux. A more complex radiation model is necessary to explain these data, which are probably due to the large antenna array.

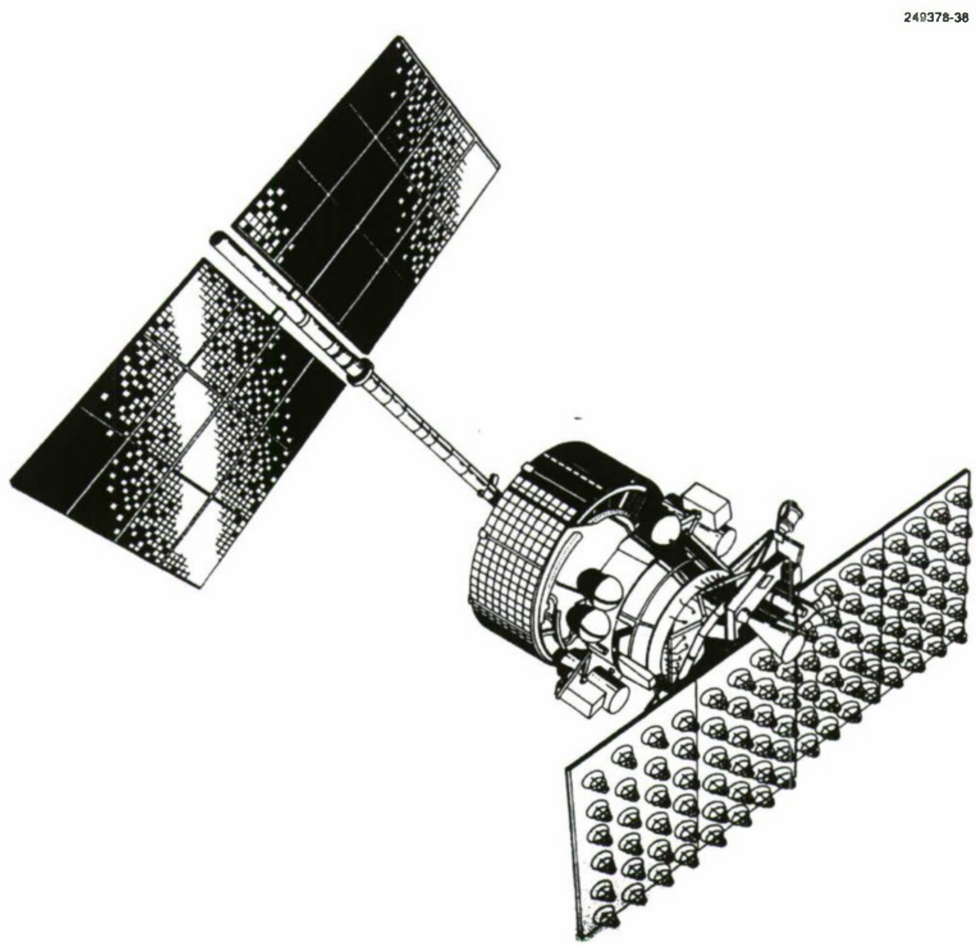

Figure 32. Ekran satellite. (Used with permission. Donald H. Martin, Communication Satellites 1958–1992, ©1991, The Aerospace Corporation.)

11.5 ATS-6

The Application Technology Satellite (ATS)-6, SSC number 7318, was active for more than five years. It was used for a number of experiments in satellite communications technology. It was a three-axis stabilized satellite with an enormous parabolic antenna, a split cylindrical solar cell panel, and a rectangular payload; see Figure 36 [28].

The IRAS satellite made three detections of the ATS-6, which are given in Table 20. The curiosity is the large flux measured. The antenna material was copper netting on a structure of 48 aluminum ribs, of which there is no specific knowledge of the emissivity or temperature. Still, even with extreme values of the emissivity, it is difficult to calculate such a large flux.

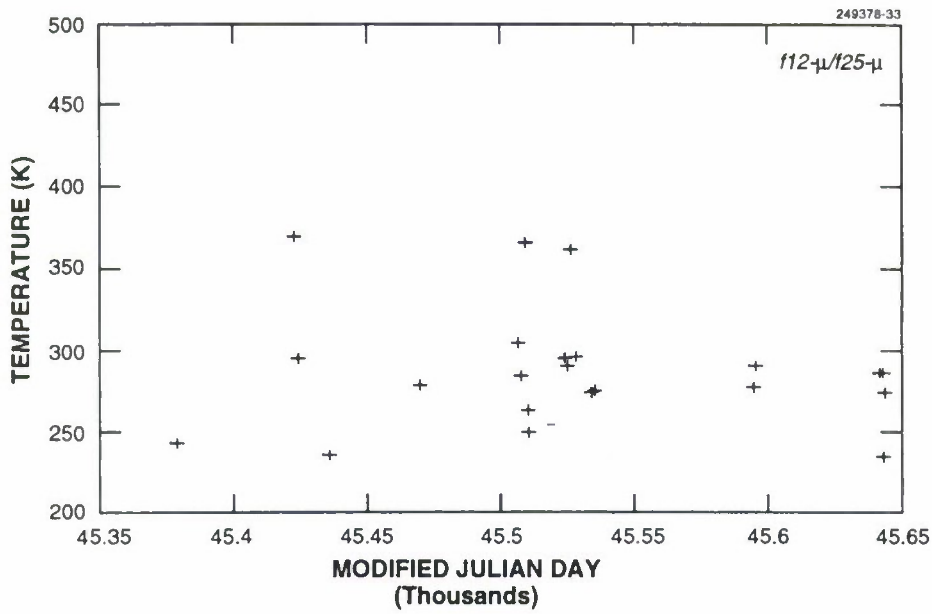

Figure 33. Ekran temperature vs. date.

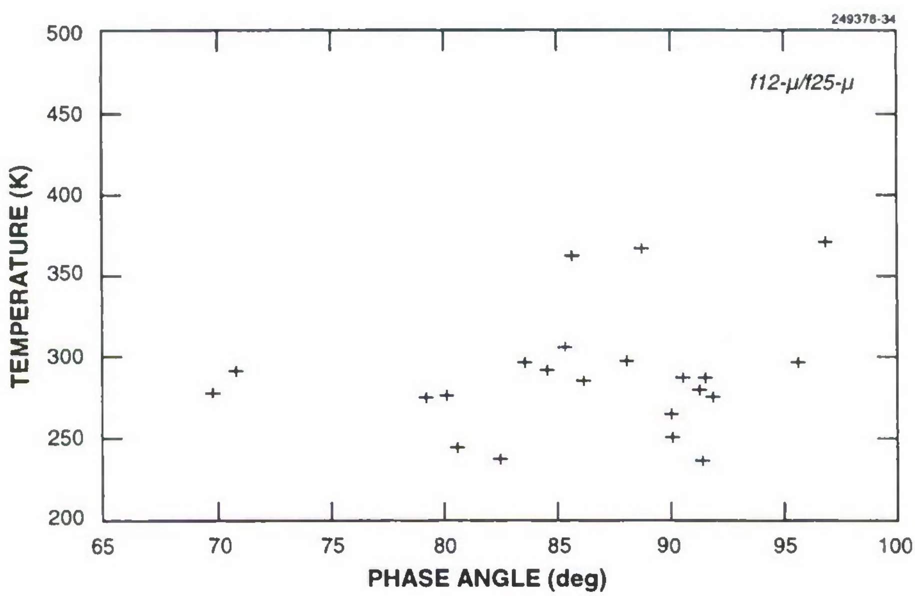

Figure 34. Ekran temperature vs. phase angle.

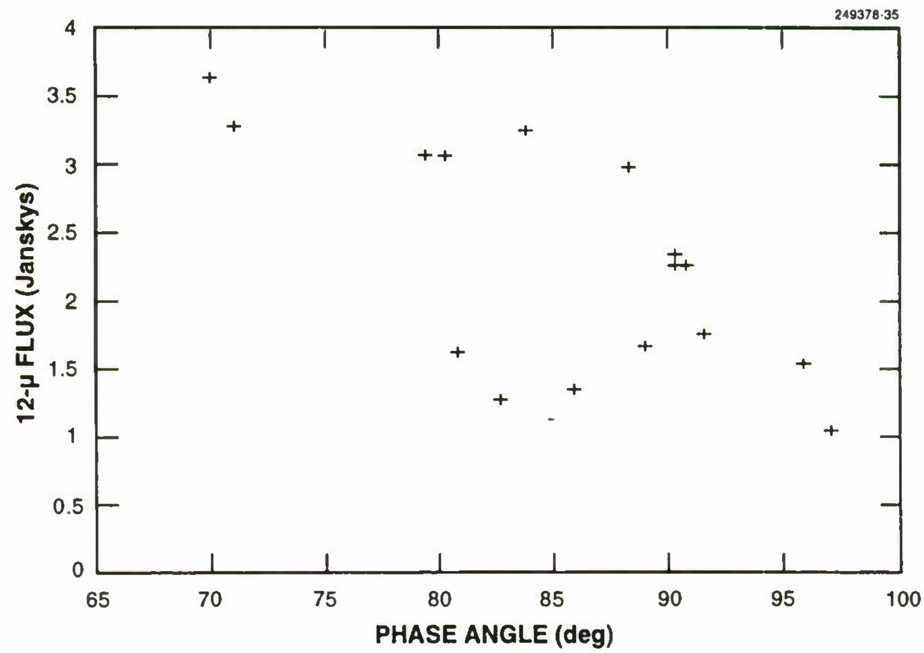

Figure 35. Ekran 12-μ flux vs. phase angle.

Figure 36. ATS-6 satellite. (Used with permission. Donald H. Martin, Communication Satellites 1958–1992, ©1991, The Aerospace Corporation.)

TABLE 20
ATS-6 Observed Flux

MJD	$J_\alpha^{12\mu}$	$J_\alpha^{25\mu}$	$J_\alpha^{60\mu}$	$T_{12\mu/25\mu}$	$T_{25\mu/60\mu}$	θ	ϕ
45521.605	4.88	6.98	2.24	284	349	92	0.3
45551.092	5.48	7.45	2.24	291	379	96	1.8
45641.552	5.51	9.00	3.42	267	287	89	0.8

12. DISCUSSION

The IRAS satellite made both position and radiometry observations of RSOs. The accuracy of the position measurement was limited by the detector size of 4.5 arcmin. This was adequate for correlation with a satellite catalogue to associate observations with specific satellites. Use of these position observations for determination of ephemerides is not addressed here. Concerning the radiometry measurements, the accuracy of a single observation is experimentally determined to be ±0.6 Jy. Of the 190,000 detections, 2047 were correlated with the known satellite catalogue. The correlation used both the position and velocity measurement. The observations were correlated with 452 satellites. Due to the zenith pointing of IRAS, most of the observations are on deep space satellites, many of which are geosynchronous.

The radiometer flux data required some screening. The principal issue concerned partial detections where the image crossed the detector edge. Lacking detailed knowledge of the image path across the detector, this could only be done statistically. Therefore, even the screened data will have some partial detections. Nevertheless, screening individual detections significantly improved the data consistency.

Calibration of the IRAS data remains a nagging question. There have been suggestions about revision of the IRAS calibration, as reviewed in Section 5. There are significant questions of interpretation that would be affected by a change in calibration. For example, for all the IRAS data there is the uniformly lower temperature observed with the 25- to 60-μ band flux ratio than observed with the 12- to 25-μ band flux ratio. This is true for the majority of the observations and is particularly striking in the Hughes HS-376 cylinders. As Table 3 shows, most critiques suggest that the 25-μ fluxes are high by 4% to 10%. For our analysis of the HS-376 cylinders, changing the calibration in this way would result in worse agreement between the IRAS observations and the models. Also, any decrease in the 25-μ flux would increase the disagreement between the 12-μ/25-μ and the 25-μ/60-μ temperatures and would increase the derived emissivities. On the other hand, for both classes, the HS-376 and the INTELSAT 4 and 4A satellites, the average value measured for emissivity is just below unity. This is 5% to 15% above the laboratory measurements for solar cells. Perhaps this is due in part to the simple model ignoring the antenna heat. Perhaps some of the excess flux density should be attributed to calibration error on the order of 5% too high in both the 12- and 25-μ bands. How to apportion these disagreements between dependence of solar cell emissivity on wavelength and calibration remains undecided. Therefore, no definite conclusion about IRAS calibration can be reached from this analysis.

IRAS observations were serendipitous. Therefore, there is no systematic set of observations for analysis. On average there were six observations for each satellite, but many satellites were observed only once. This was ameliorated by using classes of satellites that can be assumed to be virtually identical, for example, the Hughes HS-376 spin-stabilized cylinders, the GPS satellites, and a number of Soviet communication satellites. In this case a data set exceeding 20 detections could be formed.

The discussion of IR satellite radiometry inevitably turns on the properties of spacecraft materials. These include paints, solar cells, antennas, and radiators. Existing laboratory data is suggestive but not conclusive. Also, data on the effects of the space radiation environment on spacecraft materials from the LDEF are helpful. Nevertheless, the IRAS data must stand on its own. For example, the effects of TiO_2 on

rocket body temperature is consistent with expectations. However, expectations that TiO_2 will change absorptivity after exposure to the space environment are not supported by the IRAS data.

With these caveats, one can see a lot of information in the IRAS radiometry. Even with very simple models one can learn about the absorptivity and emissivity of spacecraft materials. Alternatively, by using the geometrical variation of phase angle and aspect angle, one can estimate the physical size of certain spacecraft components. Further progress will entail considerably more complex models and detailed knowledge of the spacecraft.

The fact that the IRAS was a space-based platform was extremely valuable. The whole question of atmospheric absorption is avoided, and the data have remarkable consistency. In addition, the multispectral data immediately provides information on the object temperature and leads directly to physical analysis. Much analysis of the ground-based data has suffered from both these limitations.

In 1992 no data on geosynchronous objects were published from either ground- or space-based LWIR sensors. In the winter of 1992–1993, Seniw and Rieke collected LWIR data. This included 60 tracks on 20 geosynchronous satellites in the N- and Q-bands, which allowed temperature measurements on two objects [3]. The data were obtained over a wide range of sun-sensor-satellite phase angles and included observations of temperature in and out of the earth shadow. Six geosynchronous objects observed by Seniw and Rieke were observed by IRAS a decade earlier. Two cylinders, GOES 6 and the Hughes Galaxy 1, had illumination phase angles of 52° and 64°, respectively. This is close enough to the IRAS near 90° phase angle to warrant comparison. Only astronomical N-band data were obtained from the ground so that temperature could not be determined. The radiant intensity, watts/steradian, was computed from the IRAS temperature and satellite ϵA_p and multiplied by the fraction of the total in N-band. Table 21 compares the University of Arizona and the IRAS measurements. In this calculation, following the logic in Section 9, the EOL temperature estimate for Galaxy 1 of 295 K is used instead of the observed value of 278 K.

Recall that the IRAS pointing logic generally viewed sun-tracking solar panels nearly edge-on. Therefore, for those satellites, the radiant intensity was probably from the equipment body and antennas, which is a small fraction of the RSO's radiant intensity at maximum phase. Slight changes in aspect angle would yield moderate changes in observed intensity, which we have exploited. On the other hand, spin-stabilized cylindrical solar panels present a near-constant geometry. The despun antennas are pointing at the earth but are edge-on to the sun.

TABLE 21
Ground-Based and IRAS Observations

	Category	Univ Arizona	IRAS
GOES-6 Weather Sat 14050	Phase Angle	52°	90°
	Reported Flux	0.74 Jy @ 10.6 μ	0.732 Jy @ 12 μ
	Temperature	-	325 K
	Radiant Inten.	- 169 W/sr	132 W/sr
Galaxy 1 HS-376 14158	Phase Angle	64°	90°
	Reported Flux	1.58 Jy @ 10.6 μ	1.61 Jy @ 12 μ
	Temperature	-	295 K
	Radiant Inten.	372	382

13. CONUNDRUMS

The IRAS debris data base presents a number of unanswered questions—some going to the heart of this analysis. In Section 9, analysis of Hughes HS-376 spin-stabilized cylinders (the simplest, homogeneous, and unambiguous data set available) is presented. The radiometric model is quite simple and reasonably good. The data set, after screening, seems consistent, and the derived results are quite reasonable. From the analysis of variance, we derived the formal uncertainty of a single observation as ±0.6 Jy in the 12-μ band. However, to reach this state, some data had to be edited. There were far more screened detections, with errors exceeding 1.2 Jy, than expected on the basis of Gaussian statistics. One could postulate that another satellite was observed at that time and direction. If true, then where is the measurement of the correlated satellite that we know was there at that time? One must assume that the detection was indeed of the correlated satellite, with quite a large flux error. Consequently, we have considerable concern about the error statistics of the IRAS debris data base. Unfortunately, there is insufficient data to actually discuss the error distribution function.

A data set with a related problem is derived as follows. Select all the detections that were obtained with small velocity (< 6 arcmin/sec) across the focal plane. There are 22,000 such detections. Of these, 2047 were correlated with the catalogue. Excluding the pathological case of a co-orbiting satellite, these would be observations of satellites at extreme range: geosynchronous satellites or high eccentricity satellites observed at apogee. In both cases the observed range would be 36,000 km or greater. Among these data, there are 54 detections with a 12-μ flux > 100 Jy and 10 exceeding 900 Jy. Note that a flux greater than 999.99 Jy is listed as 999.99. Of these, only nine had a 12- to 25-μ flux ratio that implied a plausible temperature, e.g., between 250 K and 400 K. Most of the large fluxes occur in only one band. There are cases where both detectors for a band registered these high values. Only three were observed at small declination, i.e., in the geosynchronous belt, with most having very high declination. These very large flux detections seem to have no consistent orbits. One must conclude that these are all bogus observations.

The reliability of a single detection, even with multiple hits, is seriously in question. With the spin-stabilized cylinders, there were hits with twice the "correct" flux value. These can be deduced because in this case there are multiple detections of a well-understood target. Detections at a geosynchronous range of 100 Jy or more seem implausible. It is difficult to assess the observed flux without multiple detections. Therefore, we believe that any conclusions based on a single detection must be made very cautiously.

APPENDIX A
IRAS DETECTIONS CORRELATED WITH THE KNOWN SATELLITE CATALOGUE

This appendix is a list of the 2047 IRAS detections correlated with the known satellite catalogue. This selection includes the detections in agreement within 0.6°. In some cases detections were not used in further analysis. The reasons include angular velocity error exceeding some value, the radiometric data being noisy, or exceeding a statistical test, as discussed in the text.

The list contains 12 items for each detection. First is the satellite identification number. We have chosen the identification given by the US Air Force Space Surveillance Center (SSC). In Appendix B we provide other information such as the international designator and orbital characteristics. All 12 items, in the following order, are given below.

1. Satellite identification number.
2. Modified Julian date of the detection.
3. Temperature, Kelvin, derived from the $f_{12\mu}/f_{25\mu}$ flux ratio.
4. Temperature, Kelvin, derived from the $f_{25\mu}/f_{60\mu}$ flux ratio. If the flux ratio is not available, then the temperature is reported as −1.
5. Quoted 12-μ flux, Janskys. Data screening is applied as described, eliminating partial detections, and the selected detections are averaged to obtain the value given here.
6. Quoted 25-μ flux, Janskys, screened in the same way as the 12-μ data.
7. Quoted 60-μ flux, Janskys, screened in the same way as the 12-μ data.
8. IRAS-satellite-sun phase angle, degrees.
9. IRAS satellite aspect angle, degrees.
10. Satellite declination of the detection.
11. IRAS-to-satellite range derived from the ephemeris, km.
12. Observed angular rate of the detection, arcmin/sec.

20	45434.0620270	382	-1	1.0600	0.9350	0.0000	85.1	15.7	-13.3	2756.0	10.56
282	45483.0942383	287	360	0.8000	1.1200	0.3500	97.4	3.0	0.2	35662.0	3.33
573	45498.8068542	298	215	3.9100	5.0600	2.6500	91.4	3.1	-6.2	5306.0	7.35
575	45628.5193481	2574	110	0.9550	0.2500	0.5100	96.0	9.6	42.6	9699.0	6.18
748	45382.8942528	236	260	0.4800	1.0350	0.4300	101.2	0.8	-65.4	56271.0	4.58
748	45476.5888824	231	283	0.3950	0.8950	0.3400	95.0	2.4	-31.2	30253.0	4.47
748	45423.5608063	368	-1	0.4500	0.4300	0.0000	83.4	2.8	-47.6	38544.0	4.33
748	45434.9509430	304	246	1.2350	1.5500	0.6850	89.6	0.7	-20.6	21116.0	4.60
748	45649.9514770	354	130	0.6850	0.7000	0.9300	95.1	2.5	-39.8	38517.0	4.58
751	45409.8125153	375	-1	0.4800	0.4400	0.0000	82.9	2.1	-64.0	57385.0	3.12
830	45528.2891846	948	102	0.8050	0.2900	0.7500	87.0	2.1	-27.9	56606.0	7.11
869	45538.8178253	271	246	0.9600	1.5050	0.6650	83.7	2.5	2.2	34259.0	4.78
869	45538.8869324	273	263	0.8050	1.2450	0.5100	83.9	2.0	-11.0	37244.0	4.74
869	45530.7429047	273	215	7.3050	11.3050	5.9150	89.7	4.0	54.6	10711.0	7.33
869	45532.0806885	292	314	1.8550	2.5050	0.8700	92.0	3.8	-40.5	27604.0	5.01
869	45532.5814667	298	578	1.8500	2.3800	0.5650	91.6	3.8	-41.9	26900.0	5.04
869	45532.8071594	278	257	1.3150	1.9600	0.8250	91.8	4.2	15.0	28161.0	4.95
898	45541.1037903	298	264	2.1000	2.7200	1.1100	86.7	0.8	-28.7	33781.0	4.77
898	45592.0558472	273	235	4.4850	6.9450	3.2400	69.5	7.9	-59.4	17270.0	5.70
1360	45413.2990036	337	182	0.9850	1.0900	0.7350	85.4	7.5	-5.9	6915.0	9.04
1361	45406.4976959	480	937	17.6900	11.2150	2.2800	93.1	17.7	-4.3	2001.0	9.16
2222	45536.5326080	280	-1	2.3600	3.4700	0.0000	80.7	3.6	-1.1	33779.0	4.71
2222	45568.5264282	352	757	3.6850	3.8000	0.8200	79.6	4.2	5.5	34124.0	4.57
2222	45393.0326386	306	224	1.6700	2.0800	1.0350	93.4	4.1	7.4	34162.0	4.49
2222	45624.5222473	288	244	2.1700	3.0100	1.3450	98.5	1.2	-10.9	32865.0	4.56
2608	45425.7874680	493	-1	0.5850	0.3550	0.0000	86.5	2.7	-10.3	35037.0	3.85
2643	45393.7840958	314	250	18.7900	22.8050	9.8900	89.4	3.7	-24.5	9438.0	5.87
2643	45574.4258118	303	252	3.2250	4.0600	1.7450	120.3	7.1	5.2	20994.0	5.32
2653	45454.7795944	350	-1	0.4500	0.4700	0.0000	81.1	4.4	-10.2	33383.0	7.47
2653	45524.5734253	265	-1	0.5100	0.8400	0.0000	82.4	2.4	-3.0	37890.0	4.41
2653	45617.0799866	596	-1	2.2200	1.1000	0.0000	98.8	1.2	-10.3	33206.0	4.83
2868	45411.8288345	276	283	2.1700	3.2950	1.2550	85.5	2.8	-2.5	32683.0	4.63
2868	45566.5511780	395	350	4.3050	3.5200	1.1250	100.5	2.5	1.2	32759.0	4.66
2868	45401.7357788	303	266	2.2400	2.8200	1.1450	89.1	1.1	-0.8	32517.0	4.61
2868	45432.9486771	485	72	0.8100	0.5050	4.5500	87.0	2.1	-2.8	32537.0	3.84
2868	45432.9486465	394	107	3.8700	3.1800	7.1600	87.0	2.1	-2.8	32546.0	4.68
2868	45434.3432617	308	273	2.3400	2.9000	1.1450	84.1	3.2	3.7	33003.0	4.66
2868	45434.3432007	249	1451	0.5250	1.0000	0.1900	84.1	3.2	3.7	33017.0	3.87
2868	45434.3433151	485	241	0.6750	0.4200	0.1900	84.1	3.2	3.7	32994.0	4.20
2868	45487.6036377	260	435	1.5750	2.7150	0.7450	86.0	1.9	4.8	32858.0	4.71
2868	45525.2540588	392	241	3.9450	3.2850	1.4850	88.4	1.7	3.6	32764.0	4.73
3029	45542.5453949	295	249	0.5050	0.6650	0.2900	87.7	4.3	-0.7	35514.0	4.55
3029	45426.0378876	458	-1	0.9300	0.6300	0.0000	93.5	3.1	8.1	35156.0	3.98
3292	45377.8226509	430	432	3.0700	2.2500	0.6200	99.4	2.0	-6.2	34076.0	4.54

3292	45381.1525803	333	339	3.2850	3.6950	1.2100	80.2	2.4	6.5	33102.0	4.52
3292	45509.2938690	296	200	1.7000	2.2200	1.2900	90.8	0.3	4.2	33291.0	4.66
3292	45523.5380402	282	286	1.7650	2.5500	0.9600	89.7	0.6	1.4	33473.0	4.67
3307	45534.0178223	286	374	18.8800	26.5150	8.0400	78.1	12.1	-23.9	5127.0	10.53
3307	45479.2942657	367	249	21.8050	20.9100	9.1200	91.9	3.3	40.8	4974.0	10.64
3431	45577.0746307	423	-1	0.3750	0.2800	0.0000	118.7	4.4	-0.4	35538.0	4.98
3432	45628.1710815	242	-1	0.3850	0.7800	0.0000	98.2	1.3	-7.4	34735.0	16.50
3848	45562.1518249	280	273	1.5500	2.2850	0.9000	88.7	13.5	-8.6	5205.0	11.14
3848	45578.5741119	271	383	1.5700	2.4700	0.7350	117.2	15.0	14.5	5220.0	11.76
3954	45478.6806488	371	-1	0.6500	0.6100	0.0000	85.0	0.5	-57.2	132485.0	4.21
3954	45497.5839386	455	-1	0.9500	0.6500	0.0000	89.4	1.0	-49.0	126855.0	4.74
3954	45497.5839386	566	-1	0.9500	0.5000	0.0000	89.4	1.0	-49.0	126856.0	4.75
3955	45641.2765808	552	-1	1.1000	0.5950	0.0000	89.3	1.0	-59.8	143117.0	5.78
4353	45545.5451965	578	-1	1.0600	0.5450	0.0000	90.7	2.0	-1.3	34965.0	4.49
4354	45516.5261078	306	440	0.5300	0.6600	0.1800	97.9	4.1	-19.3	25465.0	4.74
4354	45615.5739746	276	277	1.3700	2.0700	0.8050	99.2	4.3	6.6	13405.0	6.11
4366	45412.0031815	319	-1	0.6800	0.8100	0.0000	86.8	0.1	34.5	104793.0	4.67
4366	45423.5624618	592	-1	0.7500	0.3750	0.0000	83.5	1.0	-37.1	116303.0	3.84
4366	45423.5624618	269	-1	0.3000	0.4800	0.0000	83.5	1.0	-37.1	116299.0	4.99
4366	45611.9680481	371	161	0.3950	0.3700	0.3100	75.4	0.5	37.1	103751.0	4.20
4368	45579.1092071	284	-1	0.2200	0.3150	0.0000	60.9	1.6	-23.3	112702.0	11.51
4368	45607.8157654	348	-1	1.0450	1.1000	0.0000	72.3	0.8	28.0	102265.0	3.78
4368	45605.2750244	360	-1	0.8850	0.8800	0.0000	106.9	0.7	-25.9	117881.0	5.19
4478	45557.9279327	292	263	1.6150	2.1800	0.8950	83.0	1.9	1.1	35749.0	4.57
4478	45502.0246277	388	260	3.4200	2.9200	1.2150	79.6	4.0	-7.8	34993.0	4.57
4630	45554.7051239	277	253	3.0650	4.6100	1.9750	79.0	3.5	-4.5	30027.0	4.76
4881	45455.2184677	301	230	2.0350	2.5800	1.2400	82.0	4.5	-3.5	35516.0	4.61
4881	45456.2206726	291	276	2.1800	2.9650	1.1550	83.0	4.4	-3.5	35504.0	4.60
4882	45439.0677338	375	381	10.6300	9.7450	2.9150	94.4	3.6	9.2	23878.0	4.81
4882	45484.6008911	298	317	2.5000	3.2350	1.1150	94.9	2.9	-15.8	35885.0	4.52
4902	45381.0820923	311	252	0.6450	0.7900	0.3400	80.8	2.6	0.7	35145.0	3.64
4925	45455.5337372	259	282	0.7650	1.3350	0.5100	96.8	6.0	7.5	11941.0	5.80
4925	45462.3372650	289	313	0.9050	1.2500	0.4350	89.5	0.2	0.9	11131.0	6.09
4925	45602.3327331	339	411	0.8200	0.9000	0.2550	108.0	7.7	18.4	12750.0	5.65
5204	45540.0346222	284	226	1.9200	2.7350	1.3450	85.3	1.3	-2.4	35511.0	4.63
5204	45565.0478668	250	266	1.2600	2.3650	0.9600	102.9	3.1	-0.2	35834.0	4.52
5204	45531.8740387	276	245	1.7750	2.7000	1.2000	91.2	2.3	-2.9	35634.0	4.61
5204	45529.3328094	288	238	1.8100	2.5150	1.1600	83.6	2.9	2.5	35804.0	4.60
5204	45613.0718689	826	-1	1.7100	0.6650	0.0000	101.5	1.8	-6.2	35582.0	3.90
5204	45613.0717773	465	-1	0.8900	0.5900	0.0000	101.5	1.8	-6.2	35583.0	4.96
5205	45540.9657898	309	262	3.0500	3.7650	1.5500	86.3	0.7	-1.2	34800.0	4.61
5205	45565.4064331	381	211	1.8900	1.6750	0.9000	102.1	2.7	-1.6	35053.0	4.58
5205	45467.0951080	391	170	2.1500	1.8000	1.3700	87.7	1.1	-9.2	34449.0	4.67
5205	45557.9277039	224	-1	0.4500	1.0950	0.0000	83.0	1.9	1.1	34941.0	3.36
5205	45454.6020660	290	253	2.6500	3.6350	1.5600	97.8	2.8	9.3	35553.0	4.64

5589	45536.1331329	279	296	1.4600	2.1550	0.7850	97.7	1.8	4.2	35300.0	4.63
5589	45582.5129242	285	515	1.6050	2.2800	0.5700	116.4	4.0	1.2	35825.0	4.57
5598	45611.1387634	274	238	0.7150	1.1000	0.5050	102.8	4.7	-2.1	12440.0	5.75
5816	45545.9768524	409	928	12.5050	9.6650	1.9700	91.9	4.2	13.7	22589.0	4.90
5816	45571.8880920	353	271	4.7850	4.9300	1.9600	83.5	2.4	23.6	29419.0	4.71
5816	45554.1383820	279	353	9.4450	14.0100	4.4500	79.0	2.8	14.2	20847.0	5.03
5816	45586.8469086	355	340	6.6500	6.7800	2.2150	63.6	5.0	24.3	27332.0	4.77
5816	45610.1059265	288	322	2.6450	3.6800	1.2550	74.3	1.7	28.4	35677.0	4.56
5816	45616.0453491	358	430	3.1200	3.1300	0.8650	78.0	1.0	27.2	34948.0	4.65
5816	45645.6677246	298	511	8.5950	11.1000	2.7850	91.6	1.7	11.0	19305.0	5.23
5816	45621.9845276	341	382	3.4700	3.7750	1.1250	82.3	0.2	24.9	32363.0	4.61
5851	45462.1941071	370	195	2.4150	2.2750	1.3800	89.5	1.5	10.1	35125.0	4.64
5851	45462.1940765	548	151	0.5600	0.3050	0.2900	89.5	1.5	10.1	35120.0	8.12
5851	45517.4517059	317	225	3.1250	3.7400	1.8500	96.8	1.9	5.7	35197.0	4.64
5991	45504.3558197	524	-1	0.5100	0.2900	0.0000	96.6	3.5	-8.3	25135.0	3.19
6052	45480.0176086	295	240	1.7350	2.2850	1.0400	91.2	0.6	2.1	34991.0	4.67
6052	45554.6340027	286	260	2.0100	2.8350	1.1800	78.7	3.1	-1.9	35247.0	4.62
6052	45560.1808472	294	289	2.1550	2.8700	1.0700	85.5	2.5	1.4	35124.0	4.61
6058	45508.3592987	328	315	7.8550	9.0150	3.1250	91.9	1.2	22.5	24547.0	5.05
6058	45567.3345795	333	393	3.2100	3.6150	1.0550	99.3	1.8	22.0	35745.0	4.54
6058	45556.0280456	396	-1	0.9800	0.7950	0.0000	90.4	1.0	23.1	35616.0	22.31
6192	45470.0440063	265	236	2.8450	4.6900	2.1850	90.0	1.9	56.5	29821.0	4.62
6192	45557.0821838	258	248	2.5400	4.4750	1.9600	83.3	4.2	67.0	33856.0	4.87
6278	45459.2572555	287	341	3.4650	4.8500	1.5800	93.0	2.3	0.2	35436.0	4.65
6278	45622.5878601	378	-1	0.5800	0.5250	0.0000	99.6	2.0	1.4	35205.0	5.35
6302	45499.0350800	256	276	0.5850	1.0500	0.4100	91.7	3.5	63.8	32247.0	4.69
6302	45584.6315002	236	223	1.1600	2.4900	1.2450	62.2	6.3	39.5	22421.0	5.42
6302	45635.4575195	271	283	1.3150	2.0650	0.7850	91.0	4.3	59.7	31555.0	4.71
6437	45534.9517364	278	240	2.2250	3.3100	1.5100	79.3	3.3	-1.0	34873.0	4.63
6691	45446.4429398	251	230	1.3350	2.4950	1.2000	91.7	1.2	6.5	35067.0	4.67
6691	45394.7209663	276	284	1.5950	2.4250	0.9200	90.3	1.0	-1.5	35033.0	4.57
6779	45537.6739502	331	425	6.5700	7.4400	2.0700	82.0	4.2	9.8	24751.0	4.83
6779	45561.9417572	197	295	1.4400	4.9700	0.2900	87.6	0.2	23.4	34837.0	22.29
6779	45619.1217956	327	460	5.4750	6.3000	1.6750	80.3	0.9	23.5	25286.0	4.89
6779	45631.9295959	489	209	10.0800	6.1950	3.3850	87.4	0.9	15.8	17297.0	5.38
6877	45412.2846680	278	273	2.6300	3.9250	1.5500	86.6	0.8	59.5	38979.0	4.58
6877	45424.3818283	227	218	1.0200	2.4150	1.2400	94.8	2.4	61.0	38050.0	4.56
6877	45430.4689560	297	286	4.4150	5.7400	2.1600	88.6	1.0	64.0	32260.0	4.71
6893	45611.1109924	264	-1	0.3950	0.6600	0.0000	75.3	0.2	44.1	218499.0	9.68
6898	45447.3632126	455	220	0.7750	0.5300	0.2700	91.2	0.5	63.6	24738.0	7.59
6916	45383.0585976	772	-1	0.6600	0.2700	0.0000	101.3	6.5	38.9	24457.0	3.91
6916	45512.7789917	272	243	1.7550	2.7350	1.2250	91.8	3.4	67.0	34676.0	4.69
6916	45541.7669220	371	281	1.5850	1.4900	0.5700	87.4	2.7	64.2	30929.0	5.00
6916	45545.8390503	284	258	4.4350	6.3550	2.6650	91.7	5.3	40.6	19698.0	5.58
6916	45528.7424164	259	334	2.3500	4.0900	1.3550	87.8	2.9	67.3	34412.0	4.83

6916	45562.8610840	280	334	98.9700	145.5250	48.2250	89.3	4.6	-33.7	5322.0	12.69
6916	45392.3957558	281	218	39.1050	56.9200	29.3550	94.1	13.1	-22.6	6855.0	4.06
6916	45588.1486816	294	284	2.4300	3.2300	1.2250	66.2	3.6	65.2	31363.0	4.77
6916	45588.6473999	270	185	1.6350	2.5900	1.7000	66.3	4.6	65.2	31611.0	4.84
6916	45610.0491333	161	-1	0.1700	1.0800	0.0000	76.7	1.9	67.1	34071.0	9.31
6916	45642.4689941	278	244	1.1350	1.7000	0.7600	86.8	3.9	66.0	34862.0	4.55
6916	45644.4725342	272	271	2.8250	4.4100	1.7550	85.2	3.8	66.4	34688.0	4.56
6939	45381.7721367	281	244	1.3950	2.0350	0.9100	99.2	5.7	55.9	31079.0	4.47
6939	45385.6345825	284	262	2.5500	3.6500	1.5050	89.2	3.7	37.0	22403.0	4.55
6939	45415.6356583	281	210	1.1150	1.6250	0.8800	88.5	2.3	55.9	31000.0	4.51
6939	45626.2253113	984	107	1.0100	0.3550	0.7900	87.3	3.1	66.4	34254.0	9.33
6939	45626.2253113	458	185	0.5600	0.3800	0.2500	87.3	3.1	66.4	34256.0	3.74
6939	45626.2253418	338	216	1.5000	1.6500	0.8600	87.3	3.1	66.4	34258.0	4.47
6939	45626.2253723	565	148	1.1850	0.6250	0.6200	87.3	3.1	66.4	34260.0	6.20
6939	45626.2253113	728	112	1.1600	0.5000	0.9900	87.3	3.1	66.4	34253.0	12.55
6939	45543.0793457	218	-1	0.9000	2.3400	0.0000	89.9	1.3	-8.4	10201.0	10.59
6939	45531.6024475	419	-1	0.5700	0.4300	0.0000	90.9	2.9	63.0	30232.0	3.27
6939	45532.6016388	176	-1	0.2850	1.3900	0.0000	91.7	4.9	59.3	28725.0	7.99
6939	45532.6016693	475	-1	0.7300	0.4700	0.0000	91.7	4.9	59.3	28713.0	5.39
6939	45532.6016998	353	-1	0.4950	0.5100	0.0000	91.7	4.9	59.3	28703.0	6.76
6939	45603.6799927	278	209	1.0500	1.5650	0.8550	77.2	1.9	67.4	33397.0	4.72
6939	45609.4816589	299	301	1.1600	1.4900	0.5350	101.5	4.4	59.0	33452.0	4.73
6958	45446.5797195	270	279	1.7250	2.7250	1.0500	91.7	0.6	41.4	25873.0	5.09
6958	45481.2227325	249	-1	0.9500	1.8000	0.0000	90.0	2.5	63.7	34038.0	4.72
6958	45481.2227325	290	221	1.3150	1.8000	0.9100	90.0	2.5	63.7	34037.0	4.68
6958	45539.1305695	279	257	3.1200	4.6050	1.9400	93.8	1.9	51.3	19298.0	5.03
6958	45522.1669617	283	262	3.8950	5.6100	2.3150	91.5	2.9	57.1	23110.0	4.92
6958	45633.6557617	303	273	1.9400	2.4450	0.9650	88.6	2.7	61.8	39200.0	4.41
6958	45639.6669006	285	332	1.6950	2.4000	0.8000	88.1	3.0	63.4	38397.0	4.43
6958	45639.6669311	594	229	0.9150	0.4550	0.2200	88.1	3.0	63.4	38396.0	10.98
6974	45378.1116981	289	364	1.1250	1.5500	0.4800	100.1	3.0	0.1	35158.0	4.47
6974	45417.5931168	271	295	0.9800	1.5400	0.2400	86.8	1.4	1.6	34938.0	4.56
6974	45524.0720062	354	174	1.0400	1.0650	0.7800	82.3	2.6	-4.8	35091.0	4.69
6974	45552.0569000	316	217	1.2400	1.4900	0.7700	76.6	3.5	-3.4	35280.0	4.55
6974	45553.0590668	282	227	1.1350	1.6450	0.8050	77.4	3.3	-3.5	35232.0	4.59
6976	45384.6254578	285	293	1.5950	2.2600	0.8300	102.9	2.9	0.4	36867.0	4.44
6976	45409.8958359	310	240	1.6200	1.9900	0.9050	83.3	2.8	-0.3	36981.0	4.54
6976	45499.0560303	325	292	1.9950	2.3200	0.8550	96.6	2.2	5.7	35479.0	4.64
6976	45407.8191223	264	215	1.2100	2.0250	1.0600	96.4	3.0	-1.3	37216.0	4.46
6976	45466.8809662	284	361	1.3050	1.8600	0.5800	87.2	1.3	-5.0	37563.0	4.63
6976	45523.8571930	298	322	1.3650	1.7600	0.6000	81.8	2.5	-5.2	37505.0	4.77
6976	45391.4590950	327	286	2.0050	2.3100	0.8700	94.7	3.9	-1.2	36880.0	4.47
6976	45427.3289032	315	352	2.2250	2.6850	0.8550	91.6	1.7	2.3	35813.0	4.59
6976	45488.5334930	303	394	2.0350	2.5600	0.7450	85.1	2.2	5.7	35469.0	4.69
6976	45581.8338623	427	282	1.9500	1.4400	0.5500	60.2	4.5	-2.6	37428.0	4.55

6976	45638.3319702	298	295	2.0650	2.6550	0.9700	91.2	0.6	-4.7	37409.0	4.42
7000	45440.5662613	370	178	2.5250	2.3800	1.6700	91.9	2.4	36.8	22749.0	5.30
7000	45441.0672913	293	255	2.5050	3.3500	1.4200	92.1	2.2	37.6	23289.0	5.28
7000	45536.6244659	583	-1	0.5900	0.3000	0.0000	96.2	3.1	51.0	19078.0	9.37
7000	45454.5941009	277	327	3.4850	5.2500	1.7700	97.7	2.1	51.7	33898.0	4.73
7000	45454.5941086	353	-1	0.6800	0.7000	0.0000	97.7	2.1	51.7	33898.0	3.32
7000	45455.0951386	295	211	0.4500	0.5950	0.3200	97.8	2.1	51.9	34169.0	9.15
7000	45619.0548401	280	241	2.7300	4.0150	1.8150	80.6	0.6	48.5	31846.0	4.49
7000	45633.6560059	282	245	1.0200	1.4750	0.6550	88.6	2.7	61.8	38758.0	4.44
7000	45641.6707458	266	209	0.7400	1.2100	0.6600	89.6	3.5	63.9	36442.0	4.47
7178	45481.5083313	280	151	0.4050	0.5950	0.5700	89.3	2.1	64.2	38326.0	4.65
7178	45464.5437469	253	217	0.4700	0.8600	0.4450	87.0	1.9	55.0	36191.0	4.72
7178	45642.6716919	287	266	1.0450	1.4650	0.5950	89.9	3.2	59.5	39591.0	4.34
7250	45475.5472870	312	221	0.7700	0.9400	0.4750	81.3	3.0	-0.5	35275.0	4.70
7250	45507.6825867	491	-1	0.9000	0.5500	0.0000	85.8	1.8	-0.7	35064.0	4.67
7250	45519.7056732	281	515	0.6850	1.0000	0.2500	77.1	4.2	-0.7	35552.0	4.57
7250	45555.8510284	493	-1	0.5850	0.3550	0.0000	80.6	2.9	-0.6	35230.0	4.62
7250	45595.4650879	316	378	0.8550	1.0300	0.3100	112.8	3.8	0.5	35479.0	4.62
7260	45406.4847031	376	329	2.3300	2.1300	0.7150	93.2	3.2	52.1	39005.0	4.55
7260	45379.5007362	348	-1	1.2400	1.3050	0.0000	80.4	1.6	32.8	25975.0	15.33
7260	45382.5071220	291	255	2.2200	3.0100	1.2800	79.8	1.8	37.7	29664.0	4.80
7260	45388.5194130	280	332	1.7950	2.6400	0.8800	80.5	1.1	44.9	34891.0	4.69
7260	45401.5443649	282	281	1.7950	2.5950	0.9950	83.1	2.2	55.7	39350.0	4.53
7260	45401.5443802	229	-1	1.1000	2.5550	0.0000	83.1	2.2	55.7	39345.0	13.68
7260	45402.0451050	257	-1	1.2850	2.2800	0.0000	83.3	2.5	56.1	39395.0	4.67
7260	45402.0451050	295	324	1.6800	2.2100	0.7500	83.3	2.5	56.1	39393.0	4.55
7260	45390.4502068	280	227	1.8900	2.7800	1.3600	95.8	5.5	33.7	27338.0	4.87
7264	45546.0478363	257	247	4.8850	8.6600	3.8150	92.0	6.2	8.3	12449.0	5.22
7264	45594.8665771	285	229	0.8550	1.2150	0.5850	69.0	2.7	46.8	37126.0	4.49
7276	45539.9753265	271	193	2.4800	3.9050	2.3900	85.2	3.2	57.9	35978.0	4.55
7276	45379.5659790	391	-1	1.1200	0.9400	0.0000	80.7	1.7	63.9	37738.0	12.07
7276	45380.0678520	251	244	2.0800	3.8600	1.7200	80.5	2.0	63.6	37651.0	4.44
7276	45407.5582199	258	222	1.7300	3.0300	1.5200	91.7	2.7	60.2	32232.0	4.52
7276	45407.5581970	465	-1	0.9200	0.6100	0.0000	91.7	2.7	60.2	32241.0	19.83
7276	45382.5731850	277	130	0.3350	0.5050	0.6700	80.2	1.5	63.3	36990.0	3.48
7276	45383.0751724	270	217	1.7100	2.7150	1.4100	79.8	2.0	63.4	36859.0	4.49
7276	45409.0632782	249	336	1.9900	3.7900	1.2500	90.6	1.8	58.9	30941.0	4.58
7276	45418.5855408	240	231	3.6750	7.6000	3.6300	85.8	2.3	49.3	22547.0	4.70
7276	45421.0909500	243	235	5.6950	11.4100	5.3400	83.4	4.6	45.2	19888.0	4.73
7276	45438.0605545	264	309	12.3900	20.6800	7.2750	95.3	4.6	36.2	14976.0	4.90
7276	45438.5621262	95	295	0.3900	21.6100	0.1900	94.1	4.6	34.2	14104.0	5.60
7276	45378.0631981	238	-1	0.6800	1.4350	0.0000	80.8	2.1	63.7	38050.0	6.69
7276	45378.0631981	350	200	1.5050	1.5700	0.9150	80.8	2.1	63.7	38052.0	4.43
7276	45378.0631981	523	156	1.8000	1.0250	0.9150	80.8	2.1	63.7	38051.0	4.41
7276	45577.8413544	252	195	1.7750	3.2750	1.9850	60.3	4.8	56.9	35721.0	4.71

7276	45578.8428345	262	171	1.5700	2.6550	1.9900	60.7	4.7	57.4	36100.0	4.67
7318	45521.6047363	284	349	4.8800	6.9750	2.2350	92.2	0.3	4.5	34453.0	4.69
7318	45551.0918884	291	379	5.4850	7.4450	2.2350	96.1	1.8	2.8	34500.0	4.62
7318	45641.5521545	267	284	5.5100	8.9950	3.4150	88.9	0.8	-4.9	34312.0	4.43
7324	45420.8488846	344	-1	2.3450	2.5100	0.0000	96.3	3.0	-2.3	34988.0	4.60
7324	45460.6514740	285	299	1.7750	2.5200	0.9100	79.7	3.8	-4.2	35145.0	4.65
7324	45456.1781235	274	241	1.7800	2.7450	1.2450	96.5	2.7	4.1	35086.0	4.61
7354	45654.8389893	392	164	1.4200	1.1800	0.9550	98.5	6.6	66.6	31158.0	4.46
7369	45623.2937927	264	239	2.2500	3.7400	1.7100	98.0	8.8	52.4	13296.0	5.61
7372	45477.4274597	298	178	0.4650	0.6000	0.4200	93.8	1.3	62.1	39433.0	4.59
7372	45396.5918732	378	-1	0.5750	0.5200	0.0000	91.3	4.2	55.8	24811.0	11.61
7372	45462.0407867	350	197	0.9500	0.9900	0.5900	90.1	1.1	51.9	34066.0	4.73
7372	45521.3782654	264	220	0.7400	1.2300	0.6250	92.0	2.3	60.4	28577.0	4.80
7372	45599.3959351	279	251	8.4000	12.4450	5.3850	109.1	9.9	32.9	10610.0	5.13
7373	45538.1118317	275	247	1.0200	1.5550	0.6850	83.5	4.8	49.0	30929.0	4.59
7373	45383.5754585	429	-1	0.8300	0.6100	0.0000	78.8	1.2	63.9	39003.0	11.66
7373	45383.5753899	629	-1	0.5850	0.2800	0.0000	78.8	1.2	63.9	38999.0	9.45
7373	45383.5754013	237	132	0.4300	0.9200	1.1900	78.8	1.2	63.9	39000.0	3.79
7373	45560.5888672	293	206	0.8050	1.0800	0.6000	86.3	1.7	61.5	38301.0	4.56
7373	45424.3821182	307	401	1.1350	1.4100	0.4050	94.8	2.7	61.2	32529.0	4.37
7373	45431.0438995	421	251	1.5400	1.1550	0.5000	88.2	0.8	51.5	24945.0	16.08
7373	45431.0439148	259	275	1.4000	2.4350	0.9550	88.2	0.8	51.5	24940.0	4.79
7373	45591.6500244	243	-1	0.3700	0.7450	0.0000	67.7	3.1	63.2	39205.0	4.17
7373	45602.9559631	281	202	0.9700	1.4100	0.8100	75.1	1.4	60.9	33857.0	4.73
7373	45619.8404846	269	267	3.7600	6.0150	2.4300	80.3	0.5	40.1	17449.0	5.71
7376	45375.6114922	217	380	2.7250	7.2500	2.1700	98.4	6.7	38.1	21957.0	4.48
7376	45544.1398315	280	263	1.4200	2.0850	0.8550	87.7	2.6	49.9	29835.0	4.95
7376	45394.0839348	262	250	1.9250	3.2550	1.4100	89.1	3.6	46.5	26779.0	4.56
7376	45395.0885353	268	246	3.6700	5.9200	2.6200	90.5	3.3	48.3	27931.0	4.56
7376	45393.0802574	275	220	3.5950	5.4800	2.7800	88.1	4.5	44.8	25746.0	4.55
7376	45468.9712219	272	298	2.8200	4.4100	1.5950	89.0	2.1	62.2	37235.0	4.57
7376	45469.9737549	291	265	0.7850	1.0700	0.4350	90.0	1.8	62.5	37323.0	4.58
7376	45469.9738007	1423	-1	1.3500	0.4300	0.0000	90.0	1.8	62.5	37320.0	4.07
7376	45532.5238647	262	217	28.6450	48.6350	25.2700	91.5	14.2	2.0	6644.0	10.46
7376	45550.0828247	448	-1	0.6300	0.4400	0.0000	96.5	1.6	40.3	23515.0	4.79
7382	45539.0456696	240	303	0.4500	0.9250	0.3300	84.5	3.9	62.3	36217.0	4.61
7382	45539.0456390	749	168	1.3200	0.5550	0.4300	84.5	3.9	62.3	36225.0	10.26
7382	45591.0108948	189	626	0.4700	1.8250	0.4200	68.4	3.6	63.8	37448.0	4.62
7382	45612.2733154	260	259	0.7200	1.2350	0.5150	100.2	4.3	54.9	33030.0	4.74
7468	45537.6052399	343	295	1.1400	1.2300	0.4500	81.8	6.3	23.1	17143.0	5.49
7468	45544.8342438	277	501	0.5500	0.8300	0.2100	90.2	2.0	18.9	20820.0	5.24
7468	45617.6822510	319	232	0.6550	0.7800	0.3700	79.6	4.4	-21.3	21682.0	4.98
7468	45649.8832397	384	382	2.0750	1.8100	0.5400	94.7	3.2	-21.3	14675.0	5.13
7480	45470.5630493	258	246	3.6200	6.3500	2.8050	94.9	3.0	25.3	19503.0	5.59
7480	45480.2211609	259	248	1.1700	2.0300	0.8900	91.0	1.7	60.2	38344.0	4.60

7480	45402.6068039	270	271	2.6500	4.1850	1.6650	89.0	3.3	61.6	27024.0	4.89
7480	45403.1082764	267	299	3.3400	5.4200	1.9550	90.1	3.3	61.1	26476.0	4.92
7480	45466.1214142	262	269	2.1750	3.6950	1.4800	85.5	2.8	39.5	28227.0	5.01
7480	45487.2338867	277	215	1.5800	2.3800	1.2500	92.6	1.7	62.8	37458.0	4.55
7480	45638.0872498	290	209	2.4700	3.3700	1.8400	86.8	1.9	35.6	26691.0	4.47
7480	45638.5882873	238	245	1.6450	3.4700	1.5450	86.5	1.9	36.2	27123.0	4.49
7485	45485.3776092	266	233	0.8050	1.3250	0.6250	94.6	1.9	40.1	28348.0	5.00
7485	45648.6086121	268	249	1.3600	2.1900	0.9550	93.7	3.9	47.0	34735.0	4.37
7540	45402.6068039	270	271	2.6500	4.1850	1.6650	89.0	3.3	61.6	27024.0	4.89
7540	45402.6068115	1211	123	4.7600	1.5900	2.4200	89.0	3.3	61.6	26912.0	4.77
7540	45486.2318726	267	263	2.8550	4.6250	1.8950	94.1	1.6	63.3	37990.0	4.64
7540	45488.3057098	253	269	3.4350	6.3100	2.5300	85.9	3.1	64.8	32410.0	4.82
7540	45554.1602631	239	213	3.0600	6.3900	3.4000	91.3	2.3	58.8	22249.0	4.93
7540	45638.0876160	237	361	1.1950	2.5300	0.7900	86.8	1.9	35.6	28083.0	4.44
7540	45638.5886230	415	160	1.4950	1.1400	0.9700	86.5	1.8	36.2	28495.0	4.44
7545	45539.5026550	361	332	6.8750	6.8050	2.2650	93.5	1.5	-19.7	27453.0	4.92
7545	45546.3704681	297	362	2.2000	2.8600	0.8900	85.9	2.6	-13.1	34256.0	4.66
7545	45405.0972977	483	193	41.1500	25.7850	15.7900	93.4	5.1	-15.2	10199.0	5.55
7545	45390.5615692	382	287	16.1000	14.1900	5.3300	85.1	5.0	-22.8	16393.0	5.01
7545	45516.3128662	320	266	12.5400	14.8350	6.0150	98.2	6.4	-25.7	16053.0	5.72
7545	45548.5901642	332	284	2.8850	3.2600	1.2350	98.3	3.4	-16.7	29891.0	4.85
7545	45553.1713409	323	257	2.5950	3.0450	1.2800	93.7	0.8	-11.9	33882.0	4.70
7546	45482.2257996	343	-1	0.8350	0.9000	0.0000	88.6	2.0	56.5	38269.0	17.00
7546	45492.5300598	256	-1	0.4100	0.7350	0.0000	87.9	2.6	64.8	36197.0	3.78
7546	45649.8986816	274	240	1.0000	1.5400	0.7000	94.9	4.2	56.7	39604.0	4.30
7583	45571.0308533	286	247	4.0350	5.7000	2.5150	83.0	3.7	33.9	25055.0	4.67
7583	45404.5546951	277	224	2.9600	4.4500	2.2150	94.8	5.3	34.5	24774.0	5.06
7583	45423.0942764	278	272	2.8700	4.2700	1.6900	96.6	2.9	53.3	37319.0	4.60
7583	45422.5931320	261	299	0.8200	1.4000	0.5050	96.5	3.0	52.9	37156.0	4.70
7583	45422.5931396	289	334	0.5900	0.8150	0.2700	96.5	3.0	52.9	37153.0	3.86
7583	45582.9833984	326	275	5.7400	6.6550	2.6100	61.5	6.5	30.0	22702.0	4.77
7583	45587.9944458	289	228	4.9850	6.9000	3.3450	64.9	4.7	37.2	27535.0	4.65
7583	45588.9966125	270	256	4.4800	7.0800	2.9950	65.2	4.4	38.3	28407.0	4.60
7583	45617.6263123	285	207	0.9450	1.3450	0.7450	79.6	0.9	63.1	36278.0	4.44
7586	45411.4305572	255	292	1.5500	2.7900	1.0300	86.8	0.4	34.7	24268.0	5.17
7586	45401.1958618	286	267	4.7150	6.6300	2.6800	83.9	1.8	17.6	14705.0	6.19
7586	45427.3198471	264	297	0.7250	1.2100	0.4400	92.1	1.3	51.4	36165.0	4.64
7586	45429.3966293	268	259	0.6300	1.0200	0.4250	89.4	0.7	56.0	38547.0	4.64
7586	45429.3966217	599	-1	1.9200	0.9450	0.0000	89.4	0.7	56.0	38546.0	11.29
7586	45433.5448456	258	318	0.5950	1.0450	0.3600	85.1	1.7	62.2	39154.0	4.60
7586	45495.3956757	288	280	2.8350	3.9400	1.5150	84.5	5.4	52.3	18121.0	5.17
7586	45611.8998108	358	227	1.2250	1.2300	0.6000	75.4	0.9	54.8	38794.0	4.38
7586	45617.0532532	278	269	0.8400	1.2500	0.5000	79.1	0.6	57.9	39566.0	4.49
7625	45475.9999084	247	254	1.4050	2.7250	1.1600	95.8	2.0	40.1	34178.0	4.42
7625	45511.0863647	257	218	5.8000	10.2650	5.2950	89.5	1.1	-12.8	14133.0	4.95

7625	45459.4625015	251	217	1.5000	2.8100	1.4550	92.6	1.1	51.9	35226.0	4.47
7625	45460.9663086	258	213	1.6400	2.8800	1.5350	92.9	0.7	50.7	35267.0	4.47
7625	45460.9663086	297	227	1.0700	1.3900	0.6800	92.9	0.7	50.7	35268.0	5.40
7625	45609.0399170	569	-1	0.6500	0.3400	0.0000	74.2	1.8	67.7	26167.0	11.91
7625	45610.0417480	275	272	3.8250	5.8600	2.3200	75.1	1.5	67.7	26763.0	4.92
7625	45610.0418396	1712	-1	1.4400	0.4250	0.0000	75.1	1.5	67.7	26767.0	5.47
7625	45611.0435486	257	-1	0.4750	0.8400	0.0000	75.7	1.4	67.4	27335.0	3.87
7625	45628.5767212	326	-1	0.8200	0.9500	0.0000	85.0	3.0	59.4	34425.0	4.36
7629	45471.4184418	217	-1	0.3200	0.8450	0.0000	94.0	1.6	42.7	33728.0	8.12
7629	45626.6424866	538	144	1.2250	0.6800	0.7200	83.8	1.8	60.6	34719.0	6.49
7629	45626.6426086	307	110	0.3500	0.4350	0.9000	83.8	1.8	60.6	34721.0	5.72
7629	45627.6442566	212	139	0.4000	1.1300	1.2900	84.2	1.9	60.1	34898.0	4.67
7629	45638.6623535	284	159	0.6350	0.9050	0.7800	87.2	2.4	49.4	34598.0	4.60
7641	45475.1393433	291	271	4.2500	5.7800	2.3000	96.6	1.3	50.8	35979.0	4.70
7641	45486.2315521	260	249	1.1550	1.9800	0.8650	94.1	1.6	63.3	36834.0	4.68
7641	45594.5250854	292	263	9.2700	12.4850	5.1300	111.6	7.4	57.5	20645.0	4.74
7641	45595.5272827	290	304	8.9750	12.2650	4.3650	110.6	7.6	56.0	19325.0	4.75
7653	45475.1478271	267	369	4.9750	8.0700	2.4750	96.7	4.9	9.1	12440.0	6.92
7653	45477.2200317	286	210	1.5200	2.1400	1.1600	94.2	1.8	28.6	21451.0	5.40
7653	45553.4437714	246	298	1.1750	2.2950	0.8300	92.1	1.7	61.5	25617.0	4.77
7653	45643.8127747	314	314	2.1350	2.5900	0.9000	90.2	3.0	40.0	30085.0	4.43
7653	45601.3229370	260	230	1.7850	3.0600	1.4700	106.8	6.0	61.6	25727.0	4.59
7653	45608.4804382	279	334	3.2350	4.7800	1.5850	102.4	6.6	55.1	19661.0	4.67
7738	45500.1205292	293	1917	6.7650	9.0700	1.6400	95.3	3.0	53.1	18368.0	5.07
7738	45500.1204681	363	-1	0.5400	0.5300	0.0000	95.3	3.0	53.1	18401.0	7.27
7738	45500.6214447	793	-1	1.8300	0.7300	0.0000	94.0	3.7	52.2	17766.0	4.42
7738	45597.0129089	278	299	1.9150	2.8500	1.0300	71.1	2.6	44.0	31473.0	4.46
7738	45629.6487732	340	145	1.9450	2.1200	2.1900	86.3	2.7	64.3	31906.0	4.59
7738	45630.6506042	269	-1	2.6750	4.2900	0.0000	86.8	2.8	64.1	31294.0	4.63
7738	45630.6506653	380	-1	0.4200	0.3750	0.0000	86.8	2.8	64.1	31288.0	3.78
7738	45631.6524353	500	125	0.8450	0.5000	0.7300	87.6	3.1	64.1	30662.0	3.95
7738	45632.6542358	401	118	2.2250	1.7600	3.0200	87.9	3.3	63.7	30005.0	4.65
7738	45632.6542053	374	-1	0.4750	0.4400	0.0000	87.9	3.3	63.7	30009.0	3.11
7738	45633.6560364	247	2096	2.6900	5.2050	0.9300	88.6	3.4	61.9	29316.0	4.66
7738	45634.6578369	402	161	2.9700	2.3350	1.9600	89.6	3.8	62.6	28596.0	4.68
7738	45634.6577759	879	-1	0.7700	0.2900	0.0000	89.6	3.8	62.6	28607.0	8.06
7738	45634.6578369	292	190	1.9250	2.6000	1.6300	89.6	3.8	62.6	28599.0	4.72
7741	45479.5756378	267	302	0.9900	1.6050	0.5750	91.6	1.7	62.4	30148.0	4.78
7741	45512.2174683	567	176	0.9700	0.5100	0.3650	87.6	4.5	49.8	18787.0	5.88
7741	45512.2174835	10000	-1	1.1500	0.2650	0.0000	87.6	4.5	49.8	18790.0	11.48
7741	45425.3169174	264	413	1.4300	2.3900	0.6750	93.8	3.5	37.8	24622.0	5.14
7741	45621.9910889	391	283	0.5950	0.5000	0.1900	82.7	1.3	60.8	39327.0	6.51
7780	45398.5380936	310	291	1.3400	1.6500	0.6100	86.5	1.6	62.0	36264.0	4.46
7780	45598.9482117	312	242	3.0650	3.7450	1.6850	72.5	2.1	59.7	33643.0	4.78
7790	45648.0627136	241	204	0.5200	1.0600	0.6000	89.4	0.8	-0.2	34910.0	4.44

7794	45568.1227875	378	171	0.5150	0.4650	0.3500	98.8	2.1	17.9	27948.0	4.84
7794	45521.2496948	474	184	1.2000	0.7750	0.5150	93.0	2.2	-11.9	16221.0	5.86
7794	45586.5882416	377	-1	0.5350	0.4850	0.0000	112.9	4.7	21.1	28015.0	4.85
7794	45615.5710144	344	-1	0.4900	0.5250	0.0000	98.5	3.6	23.1	25531.0	4.73
7794	45618.3619995	341	-1	0.4700	0.5100	0.0000	97.0	3.4	22.4	24818.0	4.76
7800	45513.9888763	268	221	1.7050	2.7550	1.3900	93.4	5.6	44.1	22421.0	4.73
7800	45384.3635979	255	352	0.7300	1.3200	0.4200	78.3	1.7	64.3	38665.0	4.41
7800	45397.6075325	259	269	0.7600	1.3250	0.5300	88.0	1.8	64.3	38811.0	4.46
7902	45499.9459991	492	179	5.4500	3.3150	2.2950	92.6	4.1	-23.7	26901.0	4.92
7903	45522.1667633	314	304	3.5050	4.2500	1.5150	91.5	2.1	56.9	34498.0	4.76
7903	45582.5023956	260	579	2.2100	3.8150	0.9050	114.6	4.5	58.5	36775.0	4.47
7903	45583.5040894	255	238	1.9800	3.5750	1.6450	113.7	4.4	59.2	37025.0	4.56
8015	45569.8199463	260	-1	1.1250	1.9450	0.0000	81.6	3.6	64.0	38306.0	4.56
8015	45569.8199768	444	86	0.5600	0.3950	1.8000	81.6	3.6	64.0	38300.0	11.58
8015	45411.4267731	251	346	1.5700	2.9150	0.9400	87.3	1.0	55.2	30627.0	4.56
8015	45478.3061218	290	238	434.1550	595.5900	273.3600	93.0	12.1	-29.8	2563.0	6.53
8015	45529.8130951	234	203	2.4350	5.3300	3.0400	88.9	2.2	57.2	31939.0	4.69
8015	45555.7920990	519	232	2.0400	1.1700	0.5550	81.2	4.5	61.4	36245.0	4.54
8015	45591.7933960	253	272	1.0650	1.9600	0.7750	67.7	3.2	63.9	38202.0	4.64
8018	45429.2542038	292	212	1.5550	2.1000	1.1200	89.6	0.7	50.9	28554.0	4.54
8018	45429.2542038	1730	-1	1.2600	0.3700	0.0000	89.6	0.7	50.9	28557.0	3.75
8018	45596.0867920	239	-1	0.4550	0.9450	0.0000	71.2	2.3	64.2	38645.0	4.67
8018	45596.0867920	454	-1	0.6700	0.4600	0.0000	71.2	2.3	64.2	38643.0	9.93
8134	45555.9933166	270	214	0.5250	0.8350	0.4400	80.7	3.8	-6.4	22866.0	5.13
8134	45587.0551453	348	249	0.5900	0.6200	0.2700	64.5	5.2	-11.0	26336.0	4.78
8187	45477.2135467	270	264	2.7500	4.3500	1.7800	94.3	1.1	60.4	38482.0	4.63
8187	45436.0368042	296	269	26.3850	34.4600	13.8150	89.9	1.9	40.5	12247.0	6.85
8187	45466.2596130	271	285	2.7650	4.3500	1.6450	85.2	2.3	61.5	38381.0	4.64
8187	45593.5236816	254	265	4.3600	7.9250	3.2300	112.3	7.9	54.9	18966.0	4.77
8195	45531.9579925	288	-1	0.9150	1.2750	0.0000	91.8	3.8	60.2	35139.0	4.57
8195	45423.0239258	407	-1	0.7400	0.5750	0.0000	96.9	4.2	47.4	24812.0	5.32
8195	45422.5225143	238	246	1.4800	3.1050	1.3750	96.8	4.2	48.3	25392.0	4.56
8195	45422.5224991	304	1973	0.7100	0.8900	0.1600	96.8	4.2	48.3	25387.0	3.40
8195	45589.8615417	299	296	2.7100	3.4750	1.2650	66.5	3.5	63.8	38292.0	4.69
8274	45480.0822144	272	305	1.7150	2.6750	0.9500	91.0	1.3	38.1	26479.0	5.07
8274	45481.1542206	283	266	1.1650	1.6750	0.6800	89.9	1.8	48.6	33540.0	4.78
8274	45510.4972382	284	204	0.9000	1.2850	0.7250	89.3	2.9	65.0	33291.0	4.79
8274	45510.4972076	363	176	0.4300	0.4200	0.3000	89.3	2.9	65.0	33294.0	6.40
8274	45482.2259674	708	-1	0.9750	0.4300	0.0000	88.6	2.0	56.6	37556.0	13.31
8274	45482.2260132	391	154	1.0150	0.8500	0.7750	88.6	2.0	56.6	37559.0	4.67
8274	45482.2259674	272	-1	0.5200	0.8100	0.0000	88.6	2.0	56.6	37558.0	3.67
8274	45484.1615753	318	271	2.3950	2.8550	1.1350	96.2	2.3	35.4	24776.0	5.03
8274	45555.5195007	281	222	1.6350	2.3750	1.1900	89.5	2.3	61.3	26882.0	4.83
8274	45645.6719665	239	156	0.7000	1.4500	1.2950	91.3	3.2	33.1	24580.0	4.49
8331	45571.4203491	343	299	3.6900	3.9800	1.4350	95.2	0.9	-6.7	35700.0	4.66

8331	45548.5904541	342	382	4.7350	5.1300	1.5300	98.3	3.5	-16.6	28619.0	4.83
8366	45540.6072082	283	-1	0.5700	0.8200	0.0000	85.2	1.2	-2.6	35001.0	4.79
8366	45394.1096115	298	191	0.6650	0.8600	0.5350	92.1	2.6	-0.9	35115.0	4.50
8366	45611.0670166	465	-1	0.8600	0.5700	0.0000	102.9	2.3	-0.5	35037.0	4.54
8366	45611.0670166	388	-1	1.0100	0.8600	0.0000	102.9	2.3	-0.5	35037.0	4.03
8366	45612.0690002	492	-1	0.6750	0.4100	0.0000	102.0	2.1	-1.1	34999.0	5.39
8418	45540.8345337	261	159	0.7150	1.2200	1.0500	86.4	2.9	58.0	32571.0	4.63
8418	45582.6342773	289	275	0.8400	1.1600	0.4550	62.0	4.8	59.4	34418.0	4.68
8418	45417.2284088	289	269	1.3850	1.9100	0.7650	87.8	3.3	55.5	32289.0	4.48
8418	45526.0168304	270	188	1.0650	1.6900	1.0800	84.8	4.6	51.1	26968.0	4.75
8418	45616.0468445	275	234	2.6550	4.0400	1.9000	78.5	1.0	35.2	17964.0	5.68
8418	45648.2709961	281	300	3.8100	5.5350	1.9900	88.2	4.9	32.8	16413.0	5.77
8425	45398.5385818	286	257	2.0500	2.8950	1.2200	86.5	1.6	62.0	34775.0	4.47
8425	45398.5385666	339	160	0.6750	0.7400	0.6300	86.5	1.6	62.0	34781.0	13.22
8425	45398.5385666	400	90	0.4900	0.3900	1.5100	86.5	1.6	62.0	34782.0	4.53
8425	45398.5386505	367	107	0.3900	0.3750	0.8400	86.5	1.6	62.0	34768.0	3.56
8425	45398.5385666	565	118	0.7200	0.3800	0.6400	86.5	1.6	62.0	34780.0	4.06
8425	45399.0397720	284	280	2.8650	4.0950	1.5750	86.9	1.6	59.1	34536.0	4.47
8425	45399.0397797	2755	455	2.7500	0.7100	0.1900	86.9	1.6	59.1	34538.0	7.43
8425	45652.4902649	223	418	3.1150	7.6950	2.1600	91.2	5.5	45.1	23593.0	5.05
8462	45536.9675598	290	295	1.0500	1.4400	0.2100	82.1	5.5	54.8	29448.0	4.52
8462	45485.9278564	251	303	6.1050	11.4300	4.0850	84.0	7.0	25.5	12391.0	5.30
8462	45497.6737823	375	209	2.9050	2.6750	1.4600	89.7	4.7	40.2	18851.0	4.91
8462	45424.5979004	528	-1	1.3100	0.7400	0.0000	94.3	2.9	53.5	31147.0	7.08
8476	45415.6252365	317	-1	0.5000	0.6000	0.0000	89.7	0.8	0.0	34894.0	4.52
8476	45415.6252289	372	-1	0.5400	0.5050	0.0000	89.7	0.8	0.0	34894.0	3.30
8476	45416.6280746	256	235	0.4300	0.7700	0.3600	91.2	0.5	0.2	34887.0	4.60
8476	45417.6300278	334	147	0.5350	0.6000	0.6050	92.1	0.8	0.1	34898.0	4.53
8476	45504.6038666	282	316	0.9200	1.3300	0.4600	82.2	3.1	-0.2	35175.0	4.63
8476	45533.5908966	824	-1	0.5650	0.2200	0.0000	92.6	3.7	-0.5	35333.0	11.94
8476	45561.5792084	273	-1	0.9200	1.4300	0.0000	86.8	0.1	-0.6	34894.0	4.53
8482	45514.2303009	263	197	1.6100	2.7050	1.6100	85.4	2.5	4.7	34975.0	4.64
8482	45406.9602890	579	131	2.6700	1.3700	1.7800	95.4	2.9	-1.5	35028.0	4.54
8482	45432.8769379	291	-1	1.1300	1.5350	0.0000	86.7	2.1	-3.0	34942.0	3.30
8482	45432.8769379	302	-1	1.5650	1.9800	0.0000	86.7	2.1	-3.0	34940.0	6.47
8482	45463.8012848	266	213	2.0550	3.3800	1.7950	83.4	3.3	-4.7	35186.0	4.64
8482	45397.4762955	268	328	2.0450	3.2900	1.1050	87.9	1.0	0.4	34898.0	4.53
8482	45425.3950424	280	256	2.9650	4.3500	1.8350	93.5	2.7	2.5	35088.0	4.59
8482	45455.3189011	307	298	4.3300	5.3800	1.9450	97.2	3.0	4.1	35087.0	4.63
8492	45495.9495697	278	226	23.0150	34.2900	16.8150	88.3	4.0	16.5	8965.0	8.38
8492	45524.1686859	322	184	0.9400	1.1050	0.7300	89.1	2.4	63.7	38260.0	4.67
8492	45573.4857636	255	200	0.6800	1.2300	0.7150	119.3	5.2	58.7	36230.0	4.54
8492	45574.4876404	267	291	1.5350	2.5000	0.9250	118.7	5.1	59.0	36514.0	4.52
8492	45481.8561554	283	312	2.3950	3.4500	1.2050	88.1	2.9	61.3	34174.0	4.75
8521	45509.6405487	371	172	1.3050	1.2250	0.9100	90.0	2.6	59.2	35911.0	4.66

8521	45510.1415405	309	217	1.0450	1.2900	0.6700	90.3	2.6	59.7	36058.0	4.67
8521	45395.0198097	267	368	1.7800	2.8950	0.8900	90.0	2.7	63.8	38244.0	4.49
8521	45395.0198631	857	-1	1.2050	0.4600	0.0000	90.0	2.7	63.8	38246.0	6.37
8521	45497.0465088	573	-1	1.2700	0.6600	0.0000	83.2	5.3	31.3	17247.0	11.08
8521	45497.0465393	327	191	8.1250	9.3500	5.8300	83.2	5.3	31.3	17252.0	5.92
8521	45522.1651916	264	189	0.8500	1.4200	0.9000	91.3	2.1	62.9	38138.0	4.62
8521	45554.1592407	229	407	0.8500	1.9650	0.5600	91.5	1.5	63.9	37325.0	4.62
8521	45554.1592865	283	255	0.4600	0.6600	0.2800	91.5	1.5	63.9	37327.0	5.34
8521	45613.5598755	396	207	1.8700	1.5200	0.8400	98.4	4.0	63.2	36131.0	4.55
8521	45614.5617981	189	-1	0.5000	1.9200	0.0000	97.8	4.0	63.0	35797.0	3.83
8521	45615.5636902	268	340	1.6150	2.6000	0.8500	97.2	4.0	62.8	35441.0	4.46
8521	45618.0684509	258	238	1.3250	2.3200	1.0700	95.8	4.0	62.0	34458.0	4.54
8529	45542.1351013	482	-1	0.7000	0.4400	0.0000	90.0	2.2	63.7	38753.0	9.25
8529	45511.5035553	255	231	0.8800	1.5850	0.7550	88.1	3.1	43.4	24901.0	5.18
8529	45516.0182953	269	254	5.0000	7.9700	3.3950	99.0	5.3	15.7	11466.0	7.24
8529	45520.1627502	432	-1	0.6100	0.4450	0.0000	94.1	2.0	50.3	29437.0	20.17
8529	45520.1628113	332	-1	0.8250	0.9300	0.0000	94.1	2.0	50.3	29442.0	5.93
8529	45628.5155640	153	378	0.1800	1.3800	0.4150	95.0	4.2	63.7	36515.0	4.42
8547	45459.3984299	313	302	0.7950	0.9650	0.3450	92.7	3.3	13.3	15880.0	6.01
8547	45459.3984451	516	-1	1.3700	0.7900	0.0000	92.7	3.3	13.3	15881.0	9.04
8548	45510.0583649	252	206	0.7400	1.3650	0.7600	89.3	2.7	58.2	31210.0	4.88
8548	45534.6230774	259	282	1.9000	3.2900	1.2550	98.6	2.9	38.0	21421.0	5.45
8548	45537.1980133	286	223	1.1800	1.6650	0.8300	95.9	1.5	48.9	28399.0	4.97
8548	45497.8221893	232	228	0.4250	0.9500	0.4600	89.9	2.5	63.6	36780.0	4.64
8548	45585.4367523	273	197	0.9150	1.4150	0.8450	112.6	4.5	56.3	34601.0	4.58
8548	45640.3943787	249	320	0.7000	1.3300	0.4550	88.4	3.9	63.0	35746.0	4.45
8585	45427.0423660	237	210	0.5350	1.1400	0.6200	92.3	2.2	1.5	35075.0	4.62
8600	45385.8540192	210	399	0.4950	1.4400	0.4150	89.6	3.3	61.8	37661.0	4.44
8600	45385.8540192	265	274	0.8700	1.4400	0.5650	89.6	3.3	61.8	37661.0	4.39
8600	45403.1086044	253	199	0.5500	1.0100	0.5900	90.1	2.4	61.4	38446.0	4.47
8600	45469.0433960	348	85	0.3700	0.3900	1.8500	88.9	2.1	64.2	38010.0	9.58
8600	45469.0434265	267	141	0.7200	1.1700	1.3000	88.9	2.1	64.2	38005.0	21.72
8600	45495.9598083	242	268	0.5550	1.1200	0.4500	87.8	2.7	61.4	33841.0	4.78
8600	45495.9598083	260	300	0.7450	1.2800	0.4600	87.8	2.7	61.4	33844.0	4.61
8600	45495.9598083	421	-1	1.3600	1.0200	0.0000	87.8	2.7	61.4	33844.0	3.32
8600	45497.5349731	237	-1	0.8100	1.7200	0.0000	89.4	5.2	53.0	26509.0	4.90
8600	45519.0181427	265	245	0.9400	1.5550	0.6900	95.4	2.6	45.2	25969.0	5.18
8600	45520.5916595	267	319	0.6250	1.0200	0.3500	92.7	1.8	55.4	33479.0	4.98
8600	45576.3484344	229	256	0.4050	0.9350	0.3950	117.7	5.0	57.2	35859.0	4.57
8601	45567.0984344	251	242	2.7700	5.1800	2.3400	79.1	4.8	55.9	31377.0	4.60
8620	45601.5490112	298	448	1.7350	2.2400	0.6050	108.3	3.1	1.0	35172.0	4.57
8621	45415.1302566	372	251	3.6350	3.4000	1.4700	89.5	3.1	13.2	34109.0	4.58
8621	45431.5247955	592	92	0.4700	0.2350	0.8550	84.8	4.0	7.7	35969.0	3.93
8621	45431.5248489	375	843	3.8300	3.5200	0.7350	84.8	4.0	7.7	35992.0	4.58
8621	45434.7406921	376	104	3.4300	3.1300	7.5800	88.9	1.1	5.0	35599.0	4.63

8621	45623.5932007	365	343	14.1150	13.6750	4.4400	99.1	1.4	-17.7	18314.0	4.99
8701	45555.8626556	297	-1	0.5850	0.7600	0.0000	81.2	4.8	56.9	30647.0	3.16
8701	45434.4062653	290	252	1.8000	2.4600	1.0600	84.0	2.9	49.4	26492.0	4.69
8701	45434.4062729	542	-1	2.1900	1.2050	0.0000	84.0	2.9	49.4	26486.0	12.18
8741	45476.1388855	334	257	2.1100	2.3600	0.9950	95.9	1.3	63.0	35429.0	4.66
8741	45528.1101074	271	254	8.6450	13.5700	5.7750	84.9	6.1	35.9	13999.0	5.18
8741	45617.0528564	300	207	1.3300	1.6950	0.9350	79.1	0.7	57.9	35810.0	4.47
8751	45544.5532532	261	299	1.2700	2.1650	0.7800	89.6	3.9	19.8	36471.0	4.51
8751	45410.3593063	302	358	2.0500	2.5950	0.8150	88.2	0.3	23.8	36070.0	4.49
8751	45553.7076569	356	189	1.5300	1.5500	0.9850	78.1	3.7	19.5	36302.0	4.50
8762	45477.1436615	265	347	1.3950	2.3000	0.7400	94.6	1.6	50.5	30989.0	4.89
8762	45464.6195068	246	247	4.5700	8.9350	3.9250	86.3	4.1	32.7	18914.0	5.65
8762	45467.1920319	242	257	1.6250	3.2850	1.3800	84.1	2.8	53.1	33054.0	4.87
8774	45511.0837097	286	357	0.9450	1.3350	0.4200	89.2	0.5	0.2	34901.0	4.72
8774	45511.0837097	373	266	0.9400	0.8750	0.3550	89.2	0.5	0.2	34902.0	4.78
8774	45533.0558014	356	302	1.6950	1.7200	0.6150	101.7	2.8	0.3	35145.0	4.62
8774	45533.5909576	283	-1	0.8800	1.2700	0.0000	92.6	3.7	-0.5	35326.0	5.80
8774	45560.5767975	322	222	1.1650	1.3700	0.6900	85.9	0.4	-0.2	34902.0	4.65
8774	45562.5815735	241	515	0.4500	0.9200	0.2300	88.1	0.6	-0.7	34892.0	4.65
8820	45481.0110931	588	150	0.6150	0.3100	0.3000	90.3	5.6	48.2	4970.0	3.41
8820	45562.0133667	299	235	1.3050	1.6700	0.7800	87.8	0.7	23.6	5011.0	12.72
8820	45643.1026001	402	-1	0.8400	0.6600	0.0000	91.3	14.1	69.0	5226.0	16.04
8822	45380.0657883	275	402	5.9500	9.1050	2.6100	80.6	8.9	70.1	5036.0	8.25
8822	45557.5382385	275	295	5.5000	8.4300	1.3800	88.6	8.0	-19.8	5050.0	11.97
8822	45610.4331970	311	917	6.1900	7.5800	1.5500	102.7	2.6	-54.5	5013.0	11.71
8833	45571.6239471	277	269	2.8100	4.2250	1.6950	93.1	0.6	53.6	21480.0	4.83
8833	45554.2322388	281	295	1.8250	2.6600	0.4000	91.2	2.2	57.1	24517.0	4.82
8833	45633.8659973	297	221	3.4200	4.4500	2.2500	88.7	2.5	38.4	25141.0	4.53
8833	45639.8789368	419	176	1.3000	0.9800	0.7000	88.1	2.8	49.7	32933.0	4.41
8838	45419.0241165	278	386	1.6950	2.5350	0.7500	86.1	2.4	2.2	35077.0	4.61
8838	45393.5076752	523	127	2.0650	1.1750	1.6600	86.9	4.3	-0.1	35470.0	4.33
8840	45520.6388245	391	335	5.5850	4.6900	1.5500	78.0	4.0	9.7	35263.0	4.63
8840	45527.9400940	342	319	3.5000	3.7850	1.3000	86.4	0.8	1.9	32776.0	4.71
8840	45627.6295166	569	244	112.3000	58.7850	26.2600	84.4	7.8	-17.6	6406.0	7.37
8844	45482.4380951	269	159	0.5600	0.8950	0.7750	88.5	2.0	62.4	38774.0	4.61
8844	45644.8158569	279	256	1.2400	1.8350	0.7750	91.4	3.5	46.3	31462.0	4.42
8844	45652.6198425	287	237	0.8950	1.2550	0.5800	96.9	5.0	64.0	39042.0	4.35
8882	45419.0596313	354	170	0.9350	0.9550	0.7250	94.7	2.7	-1.0	35085.0	4.51
8882	45421.0638428	400	-1	0.7450	0.5900	0.0000	96.8	3.1	-1.3	35161.0	3.89
8882	45421.0638886	288	-1	0.8950	1.2400	0.0000	96.8	3.1	-1.3	35154.0	4.59
8882	45507.0379486	359	228	1.2250	1.2250	0.5950	85.6	2.0	-1.7	34994.0	4.66
8882	45508.0407257	305	203	0.9600	1.2000	0.6850	86.5	1.2	-1.6	34918.0	4.69
8882	45551.0548553	260	241	0.8050	1.3900	0.6300	90.5	3.4	-0.6	35239.0	4.53
8882	45427.5442352	277	281	0.9500	1.4250	0.5450	91.1	1.5	1.1	34957.0	4.63
8882	45467.5599213	296	235	0.9150	1.2000	0.5600	83.1	2.9	1.7	35161.0	4.55

8882	45596.0028992	288	271	1.0250	1.4200	0.5650	70.1	3.2	-0.2	35232.0	4.57
8882	45597.0048218	314	-1	1.1150	1.3500	0.0000	70.9	3.1	0.3	35204.0	4.58
8882	45626.5240478	396	101	0.6750	0.5500	1.4700	98.8	1.7	-1.3	34963.0	3.56
8882	45627.5259399	267	473	0.8000	1.3000	0.3400	97.9	1.6	-1.3	34960.0	4.60
8882	45628.5278015	266	251	0.8100	1.3300	0.5750	97.1	1.5	-1.4	34948.0	4.50
8882	45628.5278320	291	-1	0.5800	0.7900	0.0000	97.1	1.5	-1.4	34948.0	3.23
8910	45478.0805054	321	-1	0.6650	0.7850	0.0000	93.3	2.3	20.2	20748.0	5.05
8910	45396.1891327	293	197	0.3950	0.5300	0.3150	89.6	3.0	5.6	25260.0	4.89
8916	45508.0400085	258	200	1.2500	2.1950	1.2750	86.9	1.2	-5.1	34903.0	4.66
8916	45509.0426788	253	241	1.2750	2.3450	1.0650	87.7	0.5	-5.0	34867.0	4.68
8916	45534.0201874	339	409	0.7400	0.8100	0.2300	78.2	3.8	-4.0	35312.0	8.57
8916	45375.5691528	253	248	1.1450	2.0950	0.9200	80.6	2.6	-1.0	35096.0	4.50
8916	45586.9853363	272	460	1.9000	2.9700	0.7900	63.9	4.1	-1.3	35432.0	4.42
8916	45587.9872894	255	291	1.7200	3.1100	1.1500	64.8	4.0	-1.1	35407.0	4.56
8916	45588.9892578	299	392	3.8850	4.9600	1.4500	65.5	3.9	-1.0	35358.0	4.59
8916	45623.5189819	261	153	1.3450	2.2900	2.1200	99.3	1.7	-3.2	34984.0	4.57
8916	45624.5208435	252	213	1.1150	2.0600	1.0950	98.5	1.5	-3.3	34971.0	4.51
8918	45419.0237198	283	328	1.7550	2.5300	0.8500	86.1	2.4	2.2	35039.0	4.60
8918	45584.9818115	321	267	2.4100	2.8400	1.1450	62.6	4.3	-1.2	35467.0	4.60
8918	45577.5034332	348	244	2.0400	2.1500	0.9600	118.1	4.3	2.2	35372.0	4.55
8918	45577.5034637	552	-1	1.3400	0.7250	0.0000	118.1	4.3	2.2	35372.0	5.17
9007	45410.3498001	281	246	34.8350	50.6900	22.4700	88.9	8.6	70.7	2048.0	24.40
9007	45521.6406250	565	419	61.5250	32.4500	9.0900	79.2	16.0	-2.1	2091.0	22.09
9009	45465.0195160	405	-1	0.9600	0.7500	0.0000	85.4	2.3	-1.4	39322.0	6.66
9017	45480.1565247	333	181	0.4350	0.4900	0.3350	90.9	0.9	24.8	23284.0	5.02
9017	45496.1178894	473	-1	0.9800	0.6350	0.0000	84.2	3.4	21.4	26057.0	8.55
9017	45524.3947144	298	236	0.4350	0.5600	0.2600	89.1	1.4	9.7	25603.0	4.86
9047	45375.5366554	9386	-1	2.5800	0.6000	0.0000	98.6	4.7	0.1	35619.0	5.13
9049	45380.1269684	391	191	7.0150	5.8750	3.6600	99.7	6.1	52.4	29434.0	4.49
9049	45381.1301880	359	569	6.0300	6.0250	1.4400	99.9	6.1	53.4	30390.0	4.46
9049	45381.1301384	963	179	0.6450	0.2300	0.1600	99.9	6.1	53.4	30370.0	11.30
9049	45381.1301651	231	-1	0.4350	0.9900	0.0000	99.9	6.1	53.4	30377.0	5.06
9049	45509.9166412	202	329	0.9950	3.2200	1.0800	88.9	2.7	63.4	37311.0	4.66
9049	45376.1143494	319	203	7.0800	8.4350	4.8100	99.3	6.7	47.0	25295.0	4.54
9049	45378.1208839	390	370	9.8900	8.3500	2.5550	99.6	6.3	50.0	27491.0	4.50
9049	45542.6379700	208	323	1.7100	5.1000	1.7350	89.2	2.2	51.2	28772.0	4.81
9049	45543.1388245	350	136	2.6500	2.7650	3.3100	89.3	2.2	51.7	29139.0	4.80
9049	45618.4976196	290	-1	0.5900	0.8050	0.0000	95.2	3.6	63.1	38204.0	5.51
9049	45647.4782410	259	334	1.5650	2.7150	0.9000	87.5	4.0	64.7	36859.0	4.36
9269	45379.6246452	314	177	0.5150	0.6250	0.4400	98.5	5.5	53.7	32231.0	3.82
9269	45379.6246872	262	227	1.1400	1.9250	0.9400	98.2	5.4	54.4	32234.0	4.50
9269	45379.6246796	4740	-1	1.7750	0.4300	0.0000	98.2	5.4	54.4	32233.0	6.67
9269	45379.6247330	253	892	0.9250	1.7000	0.3500	98.3	5.6	57.5	32237.0	7.36
9269	45415.9944839	265	227	0.9450	1.5600	0.7600	89.5	2.0	59.5	33161.0	4.54
9269	45515.1343994	244	222	1.4000	2.7950	1.4050	95.1	4.3	40.5	19292.0	5.56

9269	45538.5590668	259	228	1.0800	1.8700	0.9100	94.3	1.5	45.4	23491.0	5.27
9269	45652.2002258	445	-1	0.7100	0.5000	0.0000	89.2	4.3	62.6	35254.0	8.71
9269	45393.6547050	320	276	2.0450	2.4250	0.9450	88.2	4.3	53.0	28199.0	4.52
9269	45527.3935547	166	295	0.5900	3.4500	0.2450	85.5	4.6	39.4	20169.0	11.30
9269	45603.1122742	367	-1	1.0750	1.0300	0.0000	106.0	4.6	60.2	35160.0	5.45
9269	45603.1122742	251	-1	0.6250	1.1700	0.0000	106.0	4.6	60.2	35161.0	4.47
9269	45603.1122742	371	-1	0.7450	0.7000	0.0000	106.0	4.6	60.2	35158.0	3.15
9269	45641.0382996	257	443	0.9750	1.7300	0.4700	88.1	3.8	63.6	35993.0	4.42
9269	45641.0382385	535	-1	0.6100	0.3400	0.0000	88.1	3.8	63.6	35991.0	5.59
9329	45505.9683533	332	245	21.3350	24.0850	10.7300	84.0	8.1	19.2	11763.0	6.48
9329	45543.7618713	320	408	5.9850	7.0850	2.0150	89.3	0.2	19.1	25039.0	5.03
9329	45587.8456879	493	186	2.9650	1.8000	1.1700	64.3	4.2	7.4	33059.0	4.72
9330	45409.1091232	458	137	0.6200	0.4200	0.4950	82.5	1.5	-9.2	26274.0	4.55
9330	45393.7862663	347	-1	0.4300	0.4550	0.0000	89.1	1.7	-11.2	28835.0	4.64
9411	45652.2581787	278	271	1.1450	1.7100	0.6800	99.3	6.7	58.6	31695.0	4.52
9411	45437.1998215	279	295	1.8050	2.6700	0.2300	96.2	3.9	42.2	22924.0	5.26
9411	45471.4140930	563	-1	0.6050	0.3200	0.0000	94.7	1.2	64.4	38739.0	12.09
9411	45471.4140930	553	-1	0.4450	0.2400	0.0000	94.7	1.2	64.4	38737.0	12.17
9411	45475.9950409	264	-1	0.4200	0.7000	0.0000	96.0	1.6	64.0	38382.0	4.09
9411	45405.1032333	296	143	6.1100	8.0350	8.6400	93.2	8.3	15.6	8472.0	8.06
9411	45642.0285950	254	215	0.6650	1.2100	0.6350	90.0	3.4	63.9	38211.0	4.46
9411	45645.6064453	291	259	0.9400	1.2800	0.5350	92.0	4.0	63.1	36732.0	4.51
9478	45507.7537842	295	209	0.9100	1.2000	0.6550	86.0	1.6	-3.1	34952.0	4.68
9478	45507.7537689	377	-1	0.7250	0.6600	0.0000	86.0	1.6	-3.1	34954.0	4.09
9478	45508.7564850	270	223	0.8450	1.3350	0.6650	87.1	0.8	-3.1	34942.0	4.67
9495	45539.7633057	283	-1	0.4800	0.6900	0.0000	85.1	3.8	66.5	36153.0	3.42
9495	45541.8370514	297	208	1.9400	2.5200	1.3800	87.4	2.4	58.3	31133.0	4.90
9495	45567.4745789	316	218	7.0500	8.4900	4.3700	98.8	2.2	39.3	21564.0	5.45
9495	45530.8172302	269	236	2.7850	4.4450	2.0700	90.0	2.2	66.2	35440.0	4.74
9495	45557.0247955	258	238	4.7850	8.4300	3.8850	88.9	2.0	43.4	23261.0	5.34
9495	45556.5244598	324	226	7.5200	8.7800	4.3150	88.8	1.9	42.3	22841.0	5.38
9495	45592.0840454	263	241	1.8250	3.0600	1.3850	69.3	3.5	66.2	35421.0	4.69
9495	45585.1418457	223	66	0.4500	1.1100	15.4100	64.4	3.9	62.8	34151.0	3.83
9495	45598.3911438	260	277	3.1450	5.4200	2.1050	109.4	5.6	49.2	27314.0	4.94
9506	45540.6925201	272	259	1.0450	1.6300	0.6800	86.0	3.1	62.6	34777.0	4.81
9506	45553.7058563	298	308	10.4650	13.5300	4.7750	78.1	7.9	7.0	11868.0	6.99
9506	45555.3093109	283	256	2.3650	3.4050	1.4400	90.2	2.6	40.4	19802.0	5.62
9506	45556.3095703	281	306	2.1200	3.0900	1.0950	89.4	2.0	45.2	22034.0	5.42
9506	45587.6454620	292	398	1.3900	1.8700	0.5400	65.5	4.4	63.7	35231.0	4.66
9506	45574.0647125	278	188	2.9450	4.4000	2.8100	120.2	9.8	22.9	14212.0	6.46
9506	45600.3227844	304	313	1.4750	1.8500	0.6450	108.1	5.6	52.1	26551.0	4.99
9506	45632.5227356	316	197	1.2350	1.4850	0.8850	92.5	4.4	64.5	33910.0	4.53
9574	45471.5662689	318	365	16.0450	19.1800	5.9250	93.9	3.6	20.9	14326.0	6.46
9574	45482.2242584	282	231	1.6350	2.3700	1.1300	88.7	2.2	62.6	37685.0	4.66
9574	45485.1593323	263	266	1.5550	2.6100	1.0600	95.0	1.6	56.9	34783.0	4.71

9574	45522.2367401	277	279	1.4600	2.2000	0.8500	91.2	2.4	63.5	33811.0	4.69
9574	45645.6758423	274	215	1.5600	2.3950	1.2600	91.9	3.8	52.7	33523.0	4.42
9579	45477.3664246	270	374	8.2650	13.0650	3.9600	94.1	4.9	11.4	10845.0	7.54
9579	45522.3797913	269	-1	0.6300	1.0100	0.0000	90.8	2.4	64.1	36224.0	4.75
9579	45646.6740417	377	295	2.8400	2.5800	0.2500	92.3	4.1	34.7	21064.0	4.62
9635	45483.7896728	3314	-1	2.2100	0.5550	0.0000	90.7	2.3	64.0	34947.0	10.17
9635	45513.2221832	251	211	2.4000	4.4800	2.4200	86.4	4.2	36.4	21024.0	5.47
9635	45520.0229034	330	138	2.4450	2.7850	3.2000	94.4	2.8	33.7	19570.0	5.61
9635	45521.0232239	266	385	4.1350	6.8100	2.0200	93.2	2.2	43.5	25141.0	5.16
9635	45577.4935150	281	221	1.0200	1.4850	0.7500	116.3	4.9	56.5	34563.0	4.64
9635	45595.5262756	308	-1	0.5700	0.7050	0.0000	110.6	4.6	61.2	37046.0	7.16
9635	45595.5262451	126	-1	0.2000	3.2100	0.0000	110.6	4.6	61.2	37042.0	4.34
9647	45512.8475800	264	328	0.6800	1.1300	0.3800	92.1	3.7	56.6	28332.0	4.96
9647	45541.6323700	272	-1	0.6350	0.9900	0.0000	90.2	2.2	58.8	36227.0	4.68
9647	45525.5869598	768	81	0.7050	0.2900	1.6500	83.9	5.7	50.9	24214.0	7.81
9647	45591.4483948	276	253	0.9850	1.4950	0.6400	113.9	5.0	55.0	34935.0	4.64
9829	45441.5643005	372	-1	0.3100	0.2900	0.0000	91.3	0.2	63.3	38201.0	5.33
9829	45442.0654602	253	3867	1.3550	2.4900	0.4250	91.2	0.1	63.3	38150.0	4.52
9829	45475.0672302	289	-1	0.4850	0.6700	0.0000	97.2	1.5	53.2	30701.0	3.68
9829	45424.5247116	243	210	1.0850	2.1800	1.1850	94.8	2.5	62.8	35691.0	4.48
9829	45424.5247498	289	-1	0.5450	0.7500	0.0000	94.8	2.5	62.8	35689.0	15.94
9829	45425.0255279	409	-1	0.7300	0.5650	0.0000	94.8	2.7	63.0	35909.0	22.52
9829	45612.9750061	1810	124	1.3700	0.3100	0.4600	76.5	0.8	63.8	37517.0	11.79
9850	45401.1892548	260	246	1.6150	2.7750	1.2250	84.1	1.0	53.2	24811.0	4.99
9850	45401.1892013	399	-1	0.5000	0.4000	0.0000	84.1	1.0	53.2	24800.0	4.45
9850	45630.8647461	224	215	0.4000	0.9800	0.5150	87.2	2.4	61.2	37844.0	4.60
9850	45630.8648071	360	-1	1.2400	1.2350	0.0000	87.2	2.4	61.2	37842.0	7.65
9852	45438.8895645	193	-1	0.3300	1.2100	0.0000	93.7	3.0	-1.7	35179.0	5.57
9880	45440.5611572	247	201	0.9500	1.8450	1.0650	92.0	1.1	63.3	38260.0	4.39
9880	45601.9542541	270	195	0.9700	1.5400	0.9300	74.6	1.5	61.8	34952.0	4.58
9880	45588.9279327	313	311	2.7400	3.3300	1.1650	65.7	4.8	52.4	26432.0	4.78
9880	45602.9562073	236	272	0.9450	2.0350	0.8050	75.1	1.3	61.0	35377.0	4.56
9889	45541.9078674	252	248	0.7900	1.4600	0.6400	87.5	2.3	54.7	29175.0	5.02
9889	45572.6261139	268	315	0.8600	1.3850	0.4800	91.7	1.2	55.2	29726.0	4.94
9911	45398.3235626	248	195	1.6000	3.0700	1.8600	87.2	1.7	62.9	35875.0	4.40
9911	45398.3235931	1302	106	1.4650	0.4800	1.1000	87.2	1.7	62.9	35876.0	4.88
9911	45398.3235931	9861	-1	1.3600	0.3150	0.0000	87.2	1.7	62.9	35876.0	4.27
9911	45398.3235092	308	-1	0.9300	1.1500	0.0000	87.2	1.7	62.9	35875.0	3.46
9911	45589.7910919	245	257	1.9200	3.7700	1.5900	66.5	4.4	66.0	30425.0	4.94
9921	45549.9970703	318	84	0.4350	0.5200	2.6100	89.9	2.5	66.1	30583.0	10.60
9921	45417.4414368	236	241	0.4250	0.9150	0.4150	87.6	0.6	49.2	33875.0	4.38
9921	45417.4414902	311	-1	0.4700	0.5750	0.0000	87.6	0.6	49.2	33870.0	13.34
9921	45399.2536468	233	-1	0.3900	0.8650	0.0000	86.2	1.6	62.4	36577.0	4.33
9921	45599.8793030	274	260	0.9850	1.5150	0.6300	73.1	1.8	63.2	36436.0	4.76
9921	45580.6324615	191	295	1.4200	5.3350	0.7550	61.9	5.9	60.2	26613.0	5.04

9927	45569.7443542	346	197	2.4500	2.6000	1.5450	80.9	5.6	42.9	18865.0	4.91
9927	45420.2283096	284	265	0.9300	1.3250	0.5400	84.7	2.4	63.3	36264.0	4.59
9927	45634.6567688	286	207	0.6800	0.9600	0.5300	89.4	3.0	57.6	35502.0	3.44
9931	45561.5791321	391	266	0.8850	0.7400	0.3000	86.8	0.1	-0.6	27819.0	4.77
9931	45463.5486450	397	248	8.7800	7.0800	3.1050	87.8	2.2	26.4	11330.0	6.67
9933	45417.3114471	271	363	8.5750	13.4750	4.1850	87.8	5.2	-18.5	5260.0	9.74
9933	45470.0644684	291	326	9.3950	12.7450	4.3050	96.3	8.0	15.8	5048.0	8.66
9941	45440.5611954	360	-1	2.5950	2.5800	0.0000	92.0	1.1	63.3	38217.0	4.50
9941	45441.0624008	297	255	1.0000	1.3050	0.5550	92.2	1.1	63.0	38152.0	4.56
9941	45447.5787964	296	309	1.7200	2.2600	0.7950	90.4	0.6	60.5	36632.0	4.48
9941	45399.5403671	275	991	4.7250	7.2400	1.4500	85.4	2.0	58.6	30146.0	4.80
9941	45423.5221786	273	287	3.6150	5.5900	2.1000	95.8	2.8	63.1	36022.0	4.58
9941	45424.0232620	280	290	1.8400	2.7050	1.0050	95.6	2.7	63.2	36212.0	4.68
9941	45615.9805298	286	215	2.7900	3.9450	2.0700	78.6	0.8	63.7	38384.0	4.56
9941	45615.9804688	395	-1	0.5500	0.4500	0.0000	78.6	0.8	63.7	38387.0	3.47
10000	45427.2575912	283	234	1.1550	1.6600	0.7800	91.8	1.9	0.1	36021.0	4.60
10000	45455.2479782	309	218	1.3850	1.7100	0.8800	97.3	2.9	1.1	36190.0	4.65
10000	45602.0140686	431	-1	0.7800	0.5700	0.0000	74.1	2.6	-1.1	36106.0	8.95
10000	45602.0141296	290	409	1.1300	1.5500	0.4400	74.1	2.6	-1.1	36105.0	4.51
10000	45654.4313354	339	-1	0.5100	0.5600	0.0000	91.2	0.7	-2.3	35921.0	5.62
10001	45418.7738495	284	183	1.0500	1.5000	1.0000	93.7	2.3	0.2	35053.0	4.63
10001	45429.2635727	276	228	0.8600	1.3050	0.6350	89.6	0.4	0.4	34874.0	4.68
10001	45429.2635193	351	-1	0.4900	0.5100	0.0000	89.6	0.4	0.4	34876.0	11.04
10001	45429.2635727	283	-1	0.7400	1.0650	0.0000	89.6	0.4	0.4	34875.0	4.57
10001	45429.2635727	245	188	0.5400	1.0650	0.6800	89.6	0.4	0.4	34874.0	4.67
10001	45564.2601013	268	234	0.8900	1.4300	0.6700	87.9	2.5	1.8	35085.0	4.59
10002	45468.8150787	307	296	1.5800	1.9600	0.7150	89.3	0.5	-2.0	37545.0	4.66
10002	45432.6262741	289	273	1.3200	1.8150	0.7150	85.5	2.4	0.7	35257.0	4.60
10002	45633.5742798	298	333	1.4450	1.8650	0.6200	88.2	2.2	1.6	35170.0	4.44
10002	45633.5743408	516	309	0.7900	0.4550	0.1600	88.2	2.2	1.6	35179.0	7.98
10002	45639.8698425	327	233	1.4150	1.6300	0.7700	87.7	0.8	1.8	35017.0	4.38
10025	45410.8944702	326	279	5.2200	6.0400	2.3300	84.8	3.3	-21.1	27867.0	4.76
10025	45568.2735290	295	307	13.0000	17.1600	6.0650	98.7	5.0	-21.6	14748.0	5.82
10025	45438.8867264	367	266	18.7300	17.9550	7.2900	94.0	5.1	-19.5	15323.0	5.40
10059	45466.3340759	260	227	1.7900	3.0700	1.5000	84.8	2.4	49.3	36042.0	4.49
10061	45568.5251770	296	-1	0.6750	0.8850	0.0000	79.6	4.2	-1.3	35457.0	4.56
10061	45569.5272369	319	251	0.6900	0.8200	0.3550	80.5	4.2	-1.2	35483.0	4.57
10061	45570.5294647	286	602	0.7300	1.0300	0.2400	81.5	4.5	-1.2	35550.0	4.55
10061	45427.0426178	363	242	0.9200	0.9000	0.4050	92.3	2.2	1.5	35029.0	4.56
10061	45428.0449295	320	382	0.7650	0.9050	0.2700	91.3	2.1	0.2	35020.0	4.64
10061	45432.0542831	273	239	0.6000	0.9300	0.4250	86.8	1.7	0.4	34974.0	4.55
10089	45586.9240417	246	243	2.5400	4.9400	2.2200	64.3	7.6	51.9	15837.0	5.28
10089	45623.1395569	277	460	1.0500	1.5800	0.4200	83.8	3.0	66.3	31170.0	4.67
10089	45651.8992615	219	84	0.4400	1.1400	5.8000	95.7	4.1	42.3	34780.0	4.27
10091	45538.0969086	1652	-1	1.4000	0.4200	0.0000	83.3	3.8	-24.0	19511.0	4.36

10091	45538.3486633	272	236	1.0200	1.5900	0.7400	95.0	2.0	22.2	19251.0	4.68
10091	45561.5812073	282	226	1.3500	1.9550	0.9600	87.0	0.3	10.5	19341.0	4.64
10091	45394.6060219	278	250	0.9200	1.3700	0.5950	90.9	2.6	31.0	19374.0	5.46
10091	45564.3358307	313	260	1.2750	1.5500	0.6450	88.1	4.6	-19.1	19462.0	4.52
10092	45375.6147346	431	167	1.0600	0.7750	0.6100	98.0	5.9	54.7	30536.0	3.43
10092	45375.6147957	430	-1	0.9600	0.7050	0.0000	98.0	5.9	54.7	30528.0	4.28
10092	45375.6148224	263	136	0.8400	1.4100	1.6800	98.0	5.9	54.7	30525.0	14.85
10092	45463.1136932	264	184	1.2700	2.1100	1.3950	88.8	1.7	57.6	32662.0	4.82
10092	45463.1136169	237	-1	0.3650	0.7800	0.0000	88.8	1.7	57.6	32650.0	3.44
10092	45632.0794373	231	239	1.8700	4.2400	1.9400	87.9	2.8	51.3	28620.0	4.49
10092	45633.5838928	258	280	2.2900	4.0150	1.5450	88.2	3.4	53.1	30070.0	4.47
10092	45637.5901184	273	767	0.4800	0.7450	0.1600	86.5	2.7	55.7	32415.0	6.62
10092	45637.5901794	1014	-1	1.0400	0.3600	0.0000	86.5	2.7	55.7	32423.0	3.19
10143	45382.8367157	310	244	0.8450	1.0400	0.4650	101.3	3.0	0.5	35149.0	4.44
10143	45482.3079529	274	190	0.6500	1.0000	0.6300	88.3	0.9	1.9	34919.0	4.68
10143	45401.8076553	356	309	1.0950	1.1100	0.3900	89.5	1.0	0.3	34904.0	4.58
10143	45496.8057861	292	250	0.6800	0.9200	0.4000	89.0	2.0	-2.1	34998.0	4.71
10143	45519.7770843	279	252	0.7700	1.1400	0.4900	76.9	4.1	-2.2	35430.0	4.56
10143	45598.2568970	341	167	0.7500	0.8150	0.6400	111.2	3.5	0.7	35260.0	4.57
10143	45599.2587280	367	140	0.3900	0.3750	0.4200	110.6	3.4	0.9	35232.0	3.83
10150	45379.9778290	274	294	2.1000	3.2200	1.1800	99.4	4.4	33.1	35273.0	4.69
10150	45377.9735031	269	283	1.8050	2.8800	1.0950	99.5	4.5	34.4	35718.0	4.66
10150	45537.0545654	277	305	1.9800	2.9850	1.0600	96.7	1.3	49.8	35730.0	4.47
10150	45486.0883484	227	223	1.5400	3.6600	1.8250	94.0	2.0	64.1	27869.0	4.85
10150	45487.0904541	275	295	1.9750	3.0200	0.2900	93.1	2.2	63.6	28492.0	4.89
10150	45493.1041107	260	268	2.0950	3.6200	1.4550	87.5	2.8	59.8	31792.0	4.71
10150	45554.5950470	282	306	1.7800	2.5700	0.9100	90.8	1.6	34.1	34111.0	4.44
10155	45415.5637283	254	243	2.4750	4.4950	2.0200	89.4	5.2	35.0	17966.0	5.73
10155	45447.0811615	233	273	1.7900	3.9700	1.5650	91.7	0.7	40.1	18302.0	5.76
10155	45447.0811996	211	377	0.2200	0.6300	0.1900	91.7	0.7	40.1	18311.0	19.65
10155	45471.3429108	264	-1	0.7850	1.3100	0.0000	94.7	1.4	62.5	35054.0	4.85
10155	45471.3429108	281	244	0.8900	1.3000	0.5800	94.7	1.4	62.5	35053.0	4.64
10155	45478.1431580	523	-1	1.5900	0.9050	0.0000	93.6	1.3	64.1	36800.0	16.82
10155	45507.2053070	274	245	0.7450	1.1450	0.5100	93.4	1.8	60.7	34785.0	4.60
10155	45507.2053680	1983	-1	1.7000	0.4650	0.0000	93.4	1.8	60.7	34780.0	12.11
10155	45537.1969147	292	316	1.3200	1.7800	0.6150	95.9	1.5	54.5	29477.0	4.56
10155	45537.1969910	325	332	0.4650	0.5400	0.1800	95.9	1.5	54.5	29462.0	5.05
10159	45418.5230637	251	263	0.7800	1.4600	0.6000	86.0	2.2	1.2	35077.0	4.64
10159	45623.5902405	574	-1	2.0850	1.0800	0.0000	99.1	1.8	-1.7	33535.0	3.88
10167	45423.5021057	341	182	4.8000	5.2150	3.5200	82.3	7.8	-12.7	16786.0	5.96
10167	45458.1721649	297	295	4.0600	5.2700	0.1600	94.4	0.6	63.8	18266.0	5.59
10167	45458.1722107	445	271	0.6950	0.4900	0.1950	94.4	0.6	63.8	18273.0	4.14
10167	45639.8819580	241	295	1.2600	2.5700	0.1500	88.7	5.0	65.6	21751.0	4.87
10315	45541.9093018	209	-1	0.5600	1.6450	0.0000	87.4	2.1	60.8	36580.0	4.81
10315	45555.9326782	142	-1	0.3100	3.0500	0.0000	81.1	4.9	50.3	28777.0	4.62

10315	45574.4976349	296	276	22.6400	29.7500	11.5850	120.2	15.3	1.4	6064.0	10.98
10315	45593.4560852	310	174	5.7850	7.1200	5.2000	113.3	8.5	33.1	15407.0	6.05
10369	45509.6295929	264	301	0.5200	0.8650	0.3100	88.3	3.0	61.7	35465.0	4.67
10369	45382.2213402	298	317	3.4050	4.3900	1.5150	80.4	4.0	39.5	21223.0	4.60
10369	45382.2213364	188	440	0.6800	2.6950	0.7350	80.4	4.0	39.5	21224.0	4.24
10369	45497.9643097	254	202	0.4300	0.7850	0.4500	90.0	2.6	60.5	34172.0	4.67
10369	45526.8795166	791	-1	1.1000	0.4400	0.0000	85.6	3.5	63.2	37451.0	5.97
10369	45579.8338165	254	291	3.6300	6.6100	2.4450	60.3	9.5	25.5	14138.0	6.43
10369	45583.7774200	946	365	1.5250	0.5500	0.1700	62.5	5.0	58.2	34562.0	7.54
10422	45584.5203094	393	465	1.0500	0.8700	0.2300	115.3	1.8	-19.6	81080.0	4.36
10455	45377.6192665	308	412	1.5700	1.9450	0.5500	98.1	5.5	53.8	32422.0	4.60
10455	45378.1215630	271	290	1.9300	3.0450	1.1300	99.6	5.6	49.7	31983.0	4.69
10455	45378.1215134	491	-1	0.6800	0.4150	0.0000	99.6	5.6	49.7	31986.0	3.65
10455	45463.6128235	272	248	3.2000	4.9800	2.1850	87.7	1.8	58.6	31432.0	4.87
10455	45464.1143799	258	-1	2.7300	4.8000	0.0000	87.9	1.6	59.0	31781.0	4.89
10455	45464.1144104	218	-1	0.5100	1.3400	0.0000	87.9	1.6	59.0	31787.0	5.53
10455	45488.1636047	255	266	1.0800	1.9450	0.7900	86.3	2.6	62.8	37803.0	4.72
10455	45645.1055908	260	234	2.1800	3.7700	1.7750	92.5	4.1	63.1	37186.0	4.39
10455	45596.4591370	266	267	2.4150	3.9600	1.6000	110.6	5.9	43.9	24107.0	4.62
10455	45597.4621277	278	206	1.9050	2.8400	1.5850	110.1	6.2	42.2	22907.0	4.68
10455	45598.4643860	258	-1	0.3950	0.6900	0.0000	109.5	6.3	40.2	21787.0	3.14
10455	45580.4270325	226	264	0.8750	2.1000	0.8600	114.6	4.6	58.8	35213.0	4.42
10455	45585.4368896	299	220	1.9550	2.5000	1.2700	112.6	4.7	56.3	32656.0	4.55
10485	45507.0613861	274	189	0.7300	1.1200	0.7100	94.0	1.7	63.3	38458.0	4.60
10485	45507.0613861	267	-1	0.6700	1.0900	0.0000	94.0	1.7	63.3	38458.0	4.71
10485	45538.6278686	261	357	0.8000	1.3650	0.4300	93.5	1.3	58.9	35868.0	4.55
10485	45520.3035278	299	245	0.7650	0.9800	0.4350	93.6	1.7	61.7	37828.0	4.50
10485	45632.8644714	333	245	0.4800	0.5400	0.2400	87.8	3.0	40.3	18412.0	18.91
10485	45582.2872162	286	292	0.9050	1.2750	0.4700	114.9	4.5	61.6	38473.0	4.44
10485	45582.2872162	667	-1	0.8250	0.3800	0.0000	114.9	4.5	61.6	38473.0	3.94
10485	45604.2607117	263	259	1.8700	3.1350	1.3100	106.0	5.6	41.7	24024.0	4.60
10489	45543.2914886	1720	-1	0.9000	0.2650	0.0000	89.6	1.0	2.0	34919.0	7.26
10516	45381.9048119	300	217	1.1150	1.4200	0.7350	100.2	2.5	0.5	35075.0	4.49
10516	45383.9094696	301	230	1.0700	1.3550	0.6500	102.3	2.9	0.5	35131.0	4.49
10516	45404.8853683	306	183	0.9250	1.1550	0.7700	93.1	1.9	0.1	34986.0	4.51
10557	45544.7591248	277	263	1.6450	2.4650	1.0100	90.1	1.0	-0.0	34912.0	4.65
10557	45567.7316589	259	240	1.3450	2.3400	1.0650	78.8	3.0	-0.2	35186.0	4.63
10557	45462.7283935	391	194	1.8200	1.5250	0.9300	82.5	3.4	-0.1	35269.0	4.63
10557	45463.7306671	298	342	1.6250	2.0900	0.6800	83.4	3.3	0.1	35237.0	4.62
10557	45464.7332153	277	237	1.7250	2.5850	1.1950	84.4	2.9	-0.0	35147.0	4.64
10557	45493.7245026	306	220	1.9100	2.3850	1.2100	80.0	2.9	-0.1	35147.0	4.67
10557	45395.2563477	307	212	1.8100	2.2500	1.2000	90.6	1.2	-0.1	34933.0	4.50
10557	45398.2635498	296	259	1.8200	2.3850	0.9950	87.1	1.3	-0.0	34942.0	4.53
10557	45495.2629852	291	227	1.6900	2.2900	1.1150	84.7	2.4	0.2	35069.0	4.66
10557	45519.2420349	362	189	1.7650	1.7350	1.1000	95.1	2.0	0.2	35023.0	4.66

10605	45506.9072723	260	327	3.1350	5.4000	1.8200	85.1	4.9	57.4	31150.0	4.69
10605	45507.9101410	1676	-1	1.2750	0.3800	0.0000	86.4	4.1	58.3	31736.0	4.51
10605	45508.9129181	284	306	3.4450	4.9200	1.7450	87.6	3.4	59.0	32310.0	4.57
10605	45555.8648529	329	169	2.1750	2.4900	1.9200	81.1	4.3	64.6	38459.0	4.59
10605	45560.9463959	268	286	2.3650	3.8150	1.4350	86.8	1.5	59.0	33602.0	4.76
10605	45560.9464264	2283	127	0.9350	0.2500	0.3500	86.8	1.5	59.0	33596.0	3.45
10605	45400.0461578	210	-1	0.4100	1.1800	0.0000	85.3	2.9	33.7	17956.0	18.12
10605	45403.0541382	243	295	9.5700	19.2150	2.7950	82.0	6.8	23.0	13505.0	4.57
10605	45403.5555801	239	288	14.0700	29.3900	10.9900	80.8	7.7	20.7	12672.0	4.62
10669	45382.5543404	295	255	1.9200	2.5400	1.0800	100.4	5.6	0.1	35942.0	4.39
10669	45382.5543861	391	-1	0.6100	0.5100	0.0000	100.4	5.6	0.1	35964.0	5.34
10669	45475.0052643	432	185	1.7700	1.2900	0.8450	97.0	3.0	0.9	35182.0	4.62
10669	45402.5288544	297	194	0.8700	1.1350	0.6900	90.0	4.3	1.1	35494.0	4.49
10669	45488.0338135	293	194	0.6100	0.8200	0.5000	86.3	1.6	1.7	34983.0	4.69
10669	45556.0321045	281	184	0.6150	0.8950	0.5950	90.8	0.5	2.0	34897.0	4.67
10684	45503.8160400	320	274	1.6600	1.9700	0.7750	81.5	5.3	-3.1	19494.0	5.70
10684	45499.5600128	283	279	1.1750	1.6850	0.6500	95.1	4.1	-8.2	19553.0	5.54
10684	45499.8730469	268	263	0.9550	1.5350	0.6300	92.7	5.1	-32.2	19465.0	5.80
10684	45522.8459015	317	567	1.6900	2.0250	0.4850	81.2	2.9	-53.9	19275.0	5.75
10684	45481.7829437	411	163	1.1450	0.8800	0.7200	88.2	4.2	55.0	19493.0	5.77
10696	45524.1026611	355	274	0.6000	0.6100	0.2400	89.3	3.1	40.9	21366.0	15.07
10696	45575.4908600	264	584	3.8100	6.3500	1.5000	118.1	5.9	51.4	28986.0	4.83
10696	45576.4924927	220	397	1.7450	4.4600	1.2900	117.2	5.6	52.4	29598.0	4.77
10722	45405.2014313	318	328	2.2850	2.7250	0.9150	94.8	3.8	21.5	34893.0	4.53
10722	45411.5759201	316	235	2.5150	3.0300	1.4150	86.4	0.7	21.9	30431.0	4.66
10722	45421.0953369	291	244	2.7050	3.6800	1.6400	83.7	4.3	20.7	26195.0	4.73
10723	45537.2817078	278	556	1.5100	2.2550	0.5450	96.4	4.7	-12.1	13516.0	5.64
10778	45408.7503815	304	262	2.1750	2.7300	1.1250	81.7	3.0	0.0	35165.0	4.55
10778	45409.7528076	286	250	1.8450	2.6050	1.1300	82.8	2.8	-0.0	35127.0	4.54
10778	45410.7550812	288	260	1.9200	2.6750	1.1100	83.9	2.8	-0.1	35118.0	4.52
10778	45411.7574844	270	297	1.7950	2.8400	1.0300	85.1	2.7	0.0	35095.0	4.53
10778	45413.7624512	291	212	1.8050	2.4450	1.3050	87.5	2.2	-0.0	35023.0	4.55
10778	45414.7656021	327	243	1.9550	2.2550	1.0100	89.1	1.3	0.0	34929.0	4.57
10778	45417.7728805	315	202	1.8250	2.2000	1.2650	92.6	1.1	-0.0	34921.0	4.59
10778	45505.7491302	315	224	1.8550	2.2400	1.1150	83.6	2.9	-0.2	35145.0	4.63
10778	45549.7704468	294	302	1.9250	2.5550	0.9150	89.1	0.7	-1.0	34893.0	4.67
10778	45465.2701569	288	225	1.7600	2.4500	1.2100	86.1	2.3	0.2	35038.0	4.64
10778	45633.2504272	311	298	1.8800	2.3050	0.8350	94.8	1.3	-0.0	34939.0	4.47
10778	45634.2522278	261	287	1.8150	3.0950	1.1600	94.0	1.2	0.1	34931.0	4.48
10779	45441.5736237	353	305	4.4100	4.5300	1.6100	90.9	1.1	13.8	31369.0	4.75
10779	45470.4920044	333	330	3.3050	3.7200	1.2450	95.0	1.9	21.4	35256.0	4.62
10779	45461.4741363	329	322	3.1650	3.6200	1.2350	89.9	0.3	20.4	35283.0	4.63
10779	45643.6654053	290	327	16.6100	22.7500	7.6700	90.1	2.4	18.1	13236.0	5.52
10794	45414.7708130	290	958	1.3750	1.8800	0.3800	88.7	3.7	26.6	14487.0	5.58
10801	45439.7430649	298	604	3.2550	4.2100	0.9800	94.9	6.1	-33.7	11881.0	5.16

10802	45588.0044556	283	-1	0.7900	1.1400	0.0000	66.3	4.3	62.4	35913.0	4.65
10802	45635.2445984	427	216	1.9350	1.4300	0.7450	92.0	4.8	50.2	25985.0	4.92
10803	45375.6877212	379	362	1.1100	0.9950	0.3100	98.2	5.6	60.9	33889.0	22.12
10803	45539.2737427	466	-1	1.1100	0.7350	0.0000	92.6	1.7	51.5	27501.0	14.69
10803	45403.0363388	263	283	0.7650	1.2900	0.4900	90.0	2.8	59.6	32364.0	4.52
10803	45403.0363388	648	-1	0.6600	0.3100	0.0000	90.0	2.8	59.6	32365.0	5.68
10803	45525.9395142	254	224	2.9750	5.4350	2.7050	84.3	5.6	23.2	13962.0	6.36
10803	45553.5156097	421	-1	0.5200	0.3900	0.0000	91.9	1.4	60.6	34332.0	6.68
10803	45527.1049957	263	243	1.2500	2.0950	0.9400	85.7	3.9	49.2	25996.0	5.16
10803	45640.2509766	299	268	1.2350	1.5800	0.6350	88.6	3.7	64.5	37865.0	4.42
10855	45522.2161713	317	199	0.8600	1.0300	0.6050	80.1	2.2	-0.1	35030.0	4.69
10893	45412.6796036	267	243	1.1250	1.8250	0.8200	86.4	3.8	-48.1	19668.0	5.62
10893	45412.6796646	703	-1	1.0600	0.4700	0.0000	86.4	3.8	-48.1	19662.0	3.55
10893	45468.5885467	273	3900	1.0950	1.7000	0.2900	88.5	1.8	-61.3	19468.0	5.27
10893	45574.1396637	297	228	2.7050	3.5300	1.7100	120.8	7.5	4.3	20066.0	4.57
10893	45626.6088867	396	218	0.6100	0.4950	0.2550	98.4	3.5	-62.0	19653.0	15.27
10893	45626.6089172	468	-1	1.1700	0.7700	0.0000	98.4	3.5	-62.0	19657.0	5.22
10893	45626.6087952	263	-1	0.7900	1.3300	0.0000	98.4	3.5	-62.0	19641.0	5.25
10894	45462.0109863	317	271	1.7100	2.0500	0.8150	81.8	6.3	-10.9	15051.0	4.97
10894	45583.0944672	324	281	2.9000	3.3850	1.2950	116.2	10.0	-46.7	10540.0	7.47
10894	45587.3126984	298	261	1.9800	2.5650	1.0600	113.5	7.0	-26.8	14147.0	6.40
10925	45652.1161499	586	-1	1.5800	0.8000	0.0000	96.6	5.8	53.2	28061.0	13.29
10925	45615.4938660	277	287	1.3150	1.9850	0.7450	97.5	4.2	53.5	31217.0	4.49
10925	45616.4958801	270	235	3.5250	5.5750	2.6050	97.1	4.2	52.6	30507.0	4.49
10949	45542.4925384	281	147	0.4000	0.5850	0.5900	89.3	2.0	62.7	38189.0	3.20
10949	45468.8258667	270	317	0.6400	1.0150	0.3500	88.6	2.2	52.7	32386.0	4.81
10950	45563.9448700	401	182	3.4800	2.7500	1.8600	89.9	7.4	27.1	7424.0	7.83
10950	45632.0661316	312	332	1.8200	2.2250	0.7400	88.2	4.4	-18.7	12489.0	5.89
10955	45526.2580566	232	584	30.9650	69.8300	16.4950	87.3	9.4	-1.7	2039.0	23.73
10960	45417.1214066	339	-1	0.7200	0.7900	0.0000	92.1	0.8	-40.3	15398.0	5.31
10960	45565.6294861	333	249	1.2350	1.3900	0.6050	101.6	3.6	-28.4	16447.0	5.98
10960	45570.2722321	275	321	1.7650	2.6950	0.9200	96.6	3.9	8.5	11167.0	7.17
10960	45552.0377808	817	-1	1.7400	0.6800	0.0000	95.1	5.6	-56.1	12414.0	15.33
10960	45557.5401459	300	375	1.1450	1.4550	0.4400	88.5	4.4	-33.6	16400.0	5.90
10970	45518.4448700	252	268	1.4150	2.6150	1.0500	95.8	1.6	50.8	33694.0	4.54
10970	45637.9498901	3998	-1	3.2100	0.7900	0.0000	87.2	4.6	65.8	21184.0	3.56
10970	45637.9498901	149	-1	0.7300	6.0000	0.0000	87.2	4.6	65.8	21185.0	4.44
10976	45479.2327728	354	5219	12.7050	13.0300	2.1950	92.1	1.7	-9.8	18560.0	5.54
10976	45538.0626678	313	278	3.2500	3.9450	1.5300	95.6	1.6	18.8	32916.0	4.71
10976	45493.2595978	351	361	6.1750	6.4150	2.0000	87.4	2.0	-0.2	28214.0	4.89
10976	45591.3116760	2054	-1	2.8200	0.6100	0.0000	115.3	5.4	20.3	27286.0	5.23
10981	45507.6472168	278	257	1.3400	1.9950	0.8400	92.7	1.5	-0.5	34983.0	4.66
10981	45506.6450653	282	216	1.4000	2.0300	1.0550	93.5	1.6	-0.5	34994.0	4.67
10983	45571.6657867	379	254	0.6000	0.5400	0.2300	83.4	2.5	-16.2	21039.0	5.11
10983	45633.6399536	394	-1	0.5600	0.4600	0.0000	88.8	2.5	-22.1	29386.0	3.79

10984	45538.9019775	282	223	1.1250	1.6300	0.8150	84.2	4.2	61.0	35451.0	4.63
10984	45527.8821106	281	206	0.6100	0.8900	0.4950	86.8	3.0	64.4	37651.0	4.69
10984	45573.8328400	785	153	0.6700	0.2700	0.2500	61.2	5.3	56.0	31728.0	4.02
10984	45647.4779663	306	247	3.7950	4.7300	2.0800	87.5	3.9	64.7	37883.0	4.45
10987	45419.5956268	237	230	1.8600	3.9450	1.8900	84.7	3.5	0.8	35231.0	4.55
10987	45421.5995102	253	281	1.3700	2.5200	0.9650	82.3	4.1	1.1	35355.0	4.53
10987	45375.6401825	257	249	3.2800	5.8200	2.5350	80.4	2.5	-1.3	35068.0	4.45
10987	45456.5364304	294	256	1.9550	2.6050	1.1000	95.8	2.7	2.2	34948.0	4.62
10987	45457.5387573	295	212	2.6200	3.4500	1.8500	94.5	2.4	2.4	34907.0	4.65
10987	45458.5408707	270	374	1.4150	2.2400	0.6800	93.2	2.3	2.6	34904.0	4.66
10987	45610.4229431	284	246	1.7100	2.4500	1.0850	102.8	2.2	-0.5	35036.0	4.52
10998	45651.4714661	269	271	1.0400	1.6700	0.6650	102.4	7.0	58.0	32840.0	4.48
10998	45527.0349274	432	-1	0.5750	0.4200	0.0000	86.1	3.0	39.6	36767.0	3.67
11007	45396.5401192	233	259	10.1750	22.6650	9.4500	88.7	2.0	31.8	11966.0	6.71
11007	45399.5438614	259	243	7.6500	13.2650	5.9650	85.5	3.0	40.3	15790.0	5.94
11007	45426.5305099	360	332	0.6950	0.6900	0.2300	92.3	1.9	59.5	29881.0	7.38
11007	45426.5305481	390	258	1.3300	1.1200	0.4700	92.3	1.9	59.5	29882.0	8.24
11007	45427.0317383	289	440	4.1450	5.7200	1.5600	92.5	1.8	59.5	30261.0	4.83
11007	45466.6182404	406	-1	0.6100	0.4750	0.0000	84.3	2.8	57.0	35306.0	5.22
11015	45475.8975067	232	483	7.3300	16.3800	4.2350	82.2	5.6	-15.2	15140.0	6.17
11028	45462.1936951	712	189	0.7750	0.3400	0.2150	89.5	2.1	9.6	24153.0	5.19
11054	45381.0413589	318	222	1.4500	1.7300	0.8700	100.4	1.8	-22.4	19301.0	5.62
11054	45383.0444374	287	129	1.4800	2.0750	2.8100	101.9	1.6	-27.8	19296.0	5.61
11054	45383.0444717	218	-1	0.6500	1.7100	0.0000	101.9	1.6	-27.8	19296.0	10.14
11054	45375.5346146	235	387	0.9200	2.0000	0.5900	98.3	7.2	-8.2	19845.0	5.43
11054	45441.2076950	481	-1	1.1000	0.6950	0.0000	91.9	2.3	63.8	19293.0	13.49
11054	45615.6932068	536	357	0.9700	0.5400	0.1700	78.2	1.1	57.7	19245.0	4.58
11057	45542.1352539	398	-1	0.5350	0.4300	0.0000	90.0	2.4	63.7	36582.0	5.07
11057	45495.8875580	315	260	4.0000	4.8300	2.0050	87.8	2.5	58.5	36050.0	4.71
11057	45501.5313568	338	289	0.8550	0.9400	0.3500	94.0	9.4	3.9	8798.0	5.18
11073	45539.9760895	258	124	0.4900	0.8600	1.2900	85.7	3.2	61.0	36270.0	4.72
11073	45529.2467194	256	103	0.4450	0.7950	2.0150	88.5	3.8	64.1	38462.0	4.57
11073	45529.2467499	187	132	0.7300	2.9100	3.7600	88.5	3.8	64.1	38469.0	3.31
11073	45573.1155395	276	264	1.3450	2.0450	0.8350	60.6	5.6	51.8	29707.0	4.92
11073	45601.9627380	289	208	1.0550	1.4600	0.8000	76.4	1.9	64.7	37935.0	4.60
11073	45636.5302429	277	308	1.0550	1.5900	0.5600	90.2	3.9	63.3	37026.0	4.49
11075	45505.2037048	281	191	0.8150	1.1900	0.7400	95.6	1.8	47.7	29268.0	4.62
11075	45512.3631439	244	263	1.1500	2.2900	0.9400	87.4	3.8	37.3	22132.0	4.78
11075	45424.0254822	319	287	2.8550	3.4000	1.2750	95.9	4.1	52.1	22882.0	5.18
11075	45433.2584000	295	227	1.3350	1.7600	0.8600	85.8	1.7	64.5	34722.0	4.69
11075	45487.3796387	220	261	0.5100	1.3050	0.5400	86.8	2.6	51.6	32619.0	4.59
11075	45487.3796387	331	-1	1.2000	1.3600	0.0000	86.8	2.6	51.6	32622.0	6.28
11075	45639.8811035	250	183	0.3550	0.6700	0.4500	88.6	3.0	61.0	39004.0	4.50
11076	45464.6675873	274	210	0.7550	1.1600	0.6300	84.2	3.6	31.3	37151.0	4.71
11076	45465.7395477	373	295	1.6750	1.5600	0.2200	85.6	2.9	18.7	33120.0	12.65

11076	45521.2342377	256	212	1.5600	2.7800	1.4900	92.6	2.8	63.8	21538.0	5.27
11079	45495.8884735	1909	139	2.8900	0.6400	0.7300	87.8	2.4	62.7	38366.0	12.10
11079	45499.0327759	283	192	0.8500	1.2250	0.7600	91.7	3.0	54.4	33378.0	4.74
11136	45584.7816315	304	-1	1.2500	1.5700	0.0000	63.4	26.0	71.9	840.0	3.59
11141	45541.4911499	251	227	0.7500	1.4000	0.6850	90.5	3.8	63.2	19474.0	5.61
11141	45500.8014526	299	236	1.1450	1.4700	0.6850	93.6	5.8	-40.7	19680.0	5.81
11142	45544.8972931	394	209	1.8700	1.5400	0.8400	90.7	3.4	-24.9	12616.0	5.25
11142	45438.5733795	298	346	2.0450	2.6350	0.8500	94.8	7.0	-25.0	12840.0	6.52
11142	45552.6262054	270	281	1.7300	2.7500	1.0550	77.0	6.4	-23.6	12991.0	5.14
11142	45563.2305298	280	349	1.8800	2.7600	0.8850	89.2	9.4	10.0	12972.0	4.96
11144	45539.6048126	249	1130	0.8400	1.6000	0.3150	84.4	1.9	-1.7	34984.0	4.79
11144	45540.6073914	299	259	1.1750	1.5000	0.6250	85.2	1.2	-2.6	34923.0	4.68
11144	45492.5788422	285	-1	0.8300	1.1800	0.0000	78.3	3.2	-1.4	35205.0	6.63
11144	45492.5789032	464	-1	2.3700	1.5800	0.0000	78.3	3.2	-1.4	35191.0	4.38
11144	45494.1175842	439	157	1.1650	0.8350	0.7400	86.4	2.3	1.3	35066.0	4.66
11144	45518.0966034	264	204	0.8600	1.4300	0.8100	96.6	2.1	1.6	35043.0	4.67
11145	45544.5786896	294	233	1.1250	1.4950	0.7050	87.5	2.1	1.6	35039.0	4.63
11145	45568.5551147	336	229	5.3300	5.9100	2.8550	98.3	2.0	1.7	35007.0	4.60
11145	45570.5595245	255	220	0.8350	1.5050	0.7650	96.0	1.4	1.5	34936.0	4.63
11145	45571.5621185	376	231	1.5250	1.3950	0.6650	94.8	0.7	1.3	34887.0	4.66
11145	45572.5646210	286	360	1.0450	1.4700	0.4600	93.7	0.2	1.3	34876.0	4.65
11145	45612.0327454	317	194	1.1800	1.4150	0.8600	75.6	2.6	-0.7	35093.0	4.50
11145	45613.0346680	279	223	1.0700	1.5800	0.7900	76.6	2.4	-0.4	35069.0	4.53
11153	45550.5585022	325	182	0.5850	0.6800	0.4600	89.5	1.5	-0.2	34943.0	4.68
11158	45510.5814819	345	191	1.8900	2.0200	1.2650	89.2	1.0	6.5	23290.0	5.26
11158	45551.9121704	282	215	0.8600	1.2450	0.6550	76.4	2.7	-10.2	47543.0	4.41
11158	45565.0095215	291	215	0.7900	1.0750	0.5650	91.2	2.0	-10.8	49790.0	4.37
11158	45583.9063873	261	245	0.8950	1.5300	0.6800	61.9	3.3	-10.7	50014.0	4.39
11158	45618.0425720	274	193	0.9750	1.4950	0.9200	79.8	1.9	-8.2	44366.0	4.33
11240	45537.5552368	276	235	1.5050	2.2750	1.0650	95.1	1.4	52.0	32193.0	4.57
11240	45538.5578613	292	349	1.6900	2.2800	0.7300	94.1	1.3	51.0	31487.0	4.60
11240	45539.5607147	251	292	1.6650	3.1200	1.1500	93.1	1.4	50.0	30700.0	4.64
11240	45541.0645599	275	262	1.3950	2.1350	0.8800	91.5	2.0	48.3	29514.0	4.63
11240	45542.0671692	278	298	1.8200	2.7200	0.9850	90.4	2.5	47.2	28675.0	4.64
11240	45543.0685730	268	-1	1.4650	2.3600	0.0000	89.5	2.2	46.1	27906.0	4.68
11240	45431.5223007	99	-1	0.9400	42.4100	0.0000	84.9	12.1	1.8	8286.0	6.86
11240	45463.6118164	259	214	0.9100	1.5800	0.8350	87.7	1.7	62.8	34680.0	4.74
11240	45574.4168701	245	356	1.9650	3.8700	1.2200	118.8	5.2	55.1	35111.0	4.41
11256	45513.5528717	857	207	1.2050	0.4600	0.2550	92.5	1.2	2.4	36481.0	4.02
11256	45545.1172638	252	213	0.4150	0.7700	0.4100	91.3	1.0	-0.3	32098.0	4.81
11256	45469.5664520	297	-1	0.6550	0.8500	0.0000	96.2	3.5	-4.7	27081.0	4.87
11256	45431.5888138	374	110	0.4550	0.4200	0.8700	84.9	2.6	4.0	41811.0	4.31
11256	45551.9859314	368	218	0.6500	0.6200	0.3200	76.4	3.9	-0.0	33343.0	4.74
11273	45506.9659576	305	239	4.4300	5.5350	2.5350	85.5	2.1	-3.2	34872.0	4.67
11273	45507.9687500	284	251	4.0550	5.8100	2.5050	86.3	1.3	-3.3	34789.0	4.67

11273	45645.0221863	234	-1	0.7900	1.7450	0.0000	91.7	0.8	1.4	34981.0	5.95
11273	45646.0239868	274	264	2.6150	4.0200	1.6450	92.0	0.8	2.8	34987.0	4.41
11328	45543.9139252	319	705	1.0250	1.2200	0.2700	89.8	1.6	63.3	34928.0	4.54
11328	45569.8916321	321	259	0.9150	1.0800	0.4500	81.8	3.6	64.6	38477.0	4.56
11328	45406.4833679	277	286	0.9150	1.3800	0.5200	93.0	3.3	59.5	37218.0	4.40
11328	45379.4950142	497	-1	0.7200	0.4300	0.0000	80.5	2.0	64.1	38495.0	5.63
11328	45379.9947090	296	285	1.9550	2.5700	0.9700	80.9	1.5	64.2	38439.0	4.45
11328	45383.0027161	337	222	1.7450	1.9300	0.9700	80.1	1.4	63.5	38569.0	4.49
11328	45377.4900780	342	229	1.6800	1.8200	0.8800	80.9	2.1	64.5	38231.0	4.43
11328	45377.9907684	313	651	2.1700	2.6400	0.6000	81.0	1.8	64.4	38255.0	4.46
11328	45462.4846954	238	280	69.1100	144.7000	55.7050	89.1	2.2	-20.5	3446.0	6.46
11328	45593.8682556	316	309	2.4350	2.9300	1.0300	69.1	2.8	63.1	38147.0	4.65
11328	45586.7852020	310	-1	2.9450	3.6250	0.0000	64.7	4.4	63.3	35737.0	4.69
11353	45419.0597839	278	161	0.8700	1.3000	1.0900	94.7	2.7	-1.0	35163.0	4.45
11353	45505.0331726	294	203	1.4800	1.9650	1.1150	83.4	2.9	-0.9	35169.0	4.64
11353	45431.5536957	338	164	0.6850	0.7550	0.6100	87.1	1.2	0.3	34865.0	4.61
11353	45466.5582886	253	236	0.6400	1.1750	0.5450	84.1	2.6	0.7	35084.0	4.62
11353	45467.5601349	286	191	0.7400	1.0450	0.6500	83.1	2.9	1.8	35113.0	4.65
11353	45596.0028076	324	237	3.5700	4.1600	1.9250	70.1	3.2	-0.2	35152.0	4.59
11353	45625.5220642	338	272	2.2300	2.4600	0.9750	99.3	1.9	-0.3	35057.0	4.53
11384	45394.4564171	299	229	1.4900	1.9100	0.9200	91.5	2.8	63.3	35450.0	4.68
11384	45593.8684387	254	183	1.2600	2.3000	1.5400	69.1	2.9	63.1	37188.0	4.58
11384	45610.9696045	312	158	1.3250	1.6200	1.4200	75.0	1.1	55.0	33711.0	4.74
11436	45383.4447899	380	482	3.1800	2.8400	0.7350	79.1	2.8	-0.4	35524.0	4.49
11436	45595.6448975	426	-1	0.7150	0.5300	0.0000	69.4	3.3	-0.6	35591.0	3.16
11440	45411.5084381	281	457	1.1700	1.7050	0.4550	87.1	1.2	-0.1	34920.0	4.52
11440	45498.4838867	282	265	1.5750	2.2800	0.9300	96.8	2.5	2.5	35073.0	4.65
11440	45539.4983673	281	239	1.4050	2.0550	0.9400	93.4	0.6	2.4	34899.0	4.68
11440	45541.5034790	267	228	1.1500	1.8650	0.9050	91.6	0.7	2.1	34900.0	4.68
11440	45394.0036812	276	252	1.4600	2.2100	0.9500	89.5	1.2	-0.4	34927.0	4.54
11440	45397.0106697	298	261	1.3800	1.7850	0.7400	93.0	1.5	0.6	34947.0	4.49
11440	45621.9800415	297	279	2.2450	2.9300	1.1300	82.4	1.5	0.7	34953.0	4.47
11440	45584.4449768	331	264	3.1700	3.5900	1.4650	115.4	4.0	1.4	35367.0	4.61
11440	45585.4467468	412	164	2.7350	2.1000	1.7050	114.6	3.8	1.5	35337.0	4.58
11474	45477.5760040	273	222	3.6550	5.6550	2.8450	93.6	2.5	38.1	15349.0	6.23
11474	45478.0768280	251	236	2.9350	5.4950	2.5500	93.7	2.3	39.5	15987.0	6.11
11474	45500.6187134	263	351	1.1000	1.8500	0.5900	94.0	2.2	62.8	34650.0	4.70
11474	45508.6370850	257	317	1.5500	2.7400	0.9450	91.3	2.2	63.3	37338.0	4.64
11474	45509.1381073	265	224	1.6200	2.6850	1.3350	91.1	2.3	63.2	37436.0	4.65
11474	45466.5280762	247	231	17.9800	34.9250	16.6950	86.5	12.0	0.2	8576.0	8.79
11474	45467.0258331	250	537	19.1850	36.2300	8.8900	87.4	3.8	1.3	8418.0	8.79
11474	45494.1754913	264	201	1.3000	2.1700	1.2500	86.6	2.8	63.4	37110.0	4.69
11474	45653.6212158	267	356	1.3500	2.1900	0.6900	97.4	5.5	62.7	35542.0	4.37
11509	45438.6096878	257	335	1.8600	3.3000	1.0900	92.8	3.1	32.2	37185.0	4.65
11509	45460.6531677	258	252	4.1850	7.3350	3.1550	79.6	5.1	3.9	26140.0	5.03

11509	45461.1585846	271	238	4.5750	7.1900	3.3100	78.5	3.8	1.4	24579.0	5.21
11509	45520.0884247	6475	156	1.4850	0.2800	0.2500	93.8	2.7	63.5	22042.0	8.39
11509	45600.2506409	275	-1	2.6750	4.0700	0.0000	108.1	5.2	55.2	30285.0	4.47
11509	45607.2655640	325	303	2.8950	3.3600	1.2000	103.8	4.1	46.4	34974.0	4.40
11509	45622.3709717	299	258	4.8150	6.1700	2.5900	100.1	3.1	13.0	29930.0	4.45
11509	45622.3710022	855	-1	0.5100	0.1950	0.0000	100.1	3.1	13.0	29926.0	3.88
11550	45415.6355057	283	294	1.6550	2.3750	0.8700	88.5	2.4	55.8	29125.0	4.90
11550	45446.9160995	342	241	1.0500	1.1350	0.5150	86.8	2.3	36.8	37294.0	4.69
11550	45436.8246078	342	170	0.8350	0.9050	0.6900	90.5	0.8	42.8	36019.0	4.70
11550	45623.6255493	290	-1	0.5250	0.7200	0.0000	83.2	6.4	0.5	2973.0	5.51
11550	45599.1050110	281	-1	1.2850	1.8800	0.0000	109.0	5.6	58.4	28802.0	7.94
11550	45612.2759399	265	169	0.4950	0.8200	0.6300	100.6	3.5	41.0	36956.0	4.35
11550	45626.5225525	348	-1	1.9600	2.0600	0.0000	98.8	2.8	6.6	26387.0	4.46
11550	45626.5226440	116	58	0.5050	11.3300	301.1900	98.8	2.8	6.6	26377.0	3.79
11551	45383.5044899	1405	238	2.1100	0.6750	0.3100	79.2	1.8	63.9	39277.0	3.60
11553	45413.0542297	275	274	1.6700	2.5450	1.0000	86.5	4.1	43.4	27885.0	4.92
11553	45413.5606461	280	216	1.6000	2.3450	1.2250	86.5	2.9	43.7	28158.0	4.94
11553	45413.5606003	297	-1	0.5800	0.7550	0.0000	86.5	2.9	43.7	28158.0	15.94
11553	45431.9501572	448	224	5.5850	3.9000	1.9400	85.5	6.1	18.4	13904.0	6.32
11553	45458.0307312	290	239	2.8150	3.8500	1.7600	94.6	3.2	48.6	20619.0	5.48
11553	45492.3167267	291	204	0.6250	0.8500	0.4800	88.5	2.3	61.9	38956.0	4.58
11553	45492.3167267	479	-1	1.2900	0.8200	0.0000	88.5	2.3	61.9	38955.0	9.30
11554	45391.1607895	290	288	1.0650	1.4600	0.5450	95.7	5.2	61.8	32335.0	4.57
11554	45430.4708939	256	265	0.6400	1.1400	0.4650	88.6	0.8	53.8	33219.0	4.51
11554	45593.5842285	239	203	0.3900	0.8100	0.4600	68.8	2.3	64.0	36700.0	4.64
11554	45595.0850220	361	-1	0.4400	0.4350	0.0000	70.2	2.5	64.2	37727.0	4.41
11555	45556.9372711	261	262	2.2650	3.8800	1.6000	82.4	6.3	60.5	20469.0	5.16
11555	45427.2465897	245	-1	0.3450	0.6800	0.0000	92.1	1.4	61.7	36107.0	3.19
11555	45455.4555359	263	259	0.6050	1.0200	0.4250	96.8	2.1	39.6	34033.0	4.44
11555	45463.0493011	406	191	1.9950	1.5550	0.9700	88.9	0.9	21.0	23696.0	4.66
11555	45630.9302673	266	210	1.3900	2.2800	1.2350	86.7	1.3	29.1	26020.0	5.03
11556	45510.4263611	211	612	0.4850	1.3800	0.3200	89.5	2.6	63.2	37851.0	4.63
11556	45510.4263611	561	-1	0.7900	0.4200	0.0000	89.5	2.6	63.2	37852.0	16.24
11556	45510.4263611	227	-1	0.5850	1.3800	0.0000	89.5	2.6	63.2	37857.0	4.66
11556	45482.2979736	248	224	1.4350	2.7650	1.3700	88.7	2.7	52.0	23171.0	5.31
11556	45465.8156586	251	276	1.3400	2.5000	0.9750	85.2	4.1	40.9	26706.0	5.02
11567	45480.5561218	328	298	4.7250	5.4300	1.9650	87.1	2.1	-6.5	34740.0	4.66
11567	45537.6360779	307	303	3.5500	4.4150	1.5750	95.4	1.9	3.2	34960.0	4.64
11567	45435.8848572	293	254	3.2700	4.3900	1.8750	90.1	0.3	-4.9	34790.0	4.62
11567	45423.4614105	270	235	2.4700	3.9000	1.8250	95.8	3.3	3.6	34881.0	4.59
11567	45433.4124756	360	184	2.2300	2.2200	1.4750	84.9	2.8	5.1	34810.0	4.62
11567	45483.0214539	285	194	1.7550	2.4950	1.5200	97.7	2.8	6.5	34960.0	4.64
11567	45603.1238403	292	253	2.8800	3.8750	1.6600	108.2	3.0	-2.2	35142.0	4.52
11569	45593.9989319	280	270	3.1100	4.5550	1.8150	68.6	3.5	-0.5	34970.0	4.57
11569	45596.4670410	374	199	2.8100	2.5900	1.5200	112.2	3.8	0.4	34981.0	4.53

11569	45624.1629028	377	-1	0.7250	0.6600	0.0000	99.2	1.7	-2.8	34656.0	3.85
11570	45541.5429993	347	257	5.2050	5.5000	2.3150	86.2	4.3	-3.2	36259.0	4.56
11570	45441.5039215	275	234	3.9950	6.1050	2.8700	91.2	1.4	2.8	35648.0	4.68
11570	45441.5040131	348	356	4.6300	4.8700	1.5350	91.2	1.4	2.8	35636.0	4.64
11570	45426.1112060	459	224	3.8400	2.5950	1.2900	93.2	2.6	1.3	35823.0	4.58
11571	45567.0870361	298	333	3.6300	4.7000	1.5600	78.2	3.2	-2.0	34934.0	4.60
11571	45379.0396156	317	246	0.7350	0.8800	0.3900	98.4	2.6	1.1	34770.0	4.46
11571	45555.2124176	268	416	0.8400	1.3500	0.3800	79.9	3.6	-2.2	35026.0	4.54
11571	45425.0368729	310	368	3.6750	4.5200	1.3900	94.7	3.4	1.0	34950.0	4.58
11571	45467.6310730	275	274	2.9850	4.5450	1.7850	82.7	3.0	3.8	34853.0	4.66
11571	45578.4336395	262	298	1.6000	2.7050	0.9800	117.5	4.2	2.2	35164.0	4.63
11571	45617.0784302	276	-1	0.3750	0.5700	0.0000	98.8	1.6	-1.9	34676.0	11.26
11589	45467.9661102	289	238	2.9550	4.0750	1.8700	87.8	3.5	50.0	20908.0	4.93
11589	45557.8683319	277	272	1.3900	2.0950	0.8300	83.3	3.2	62.0	37987.0	4.61
11589	45400.5493851	314	248	9.6850	11.7200	5.1450	84.2	5.2	19.8	14783.0	4.63
11589	45591.6554260	258	260	2.0450	3.5900	1.4900	68.6	4.0	63.1	33765.0	4.77
11589	45586.7840881	538	113	0.5500	0.3050	0.5900	64.5	4.1	61.7	38065.0	16.16
11589	45586.7840881	337	-1	0.7500	0.8300	0.0000	64.5	4.1	61.7	38064.0	8.74
11589	45585.8514862	266	239	1.1750	1.9350	0.8850	63.8	4.4	54.5	34390.0	4.78
11589	45614.4935913	129	-1	0.3000	4.3100	0.0000	98.7	5.8	44.6	19134.0	6.05
11589	45641.4684753	277	291	1.4000	2.1050	0.7800	87.4	4.2	59.3	29759.0	4.76
11589	45641.4685364	562	-1	0.8300	0.4400	0.0000	87.4	4.2	59.3	29775.0	4.81
11602	45529.5999908	240	333	0.5850	1.2050	0.4000	88.5	2.4	63.0	34036.0	4.56
11602	45587.1451721	291	235	0.9550	1.2950	0.6050	65.6	3.1	63.9	38513.0	4.67
11602	45587.7825928	253	319	1.0350	1.8950	0.6500	64.5	4.3	50.7	32966.0	4.80
11621	45549.7702484	284	269	1.0500	1.5000	0.6000	89.1	0.7	-1.0	34901.0	4.61
11621	45468.7438507	267	229	1.0500	1.7100	0.8250	89.4	0.6	-0.0	34899.0	4.66
11621	45469.7463684	272	193	0.9550	1.4900	0.9150	90.3	0.1	-0.0	34890.0	4.66
11623	45520.5309296	152	-1	0.4150	3.2000	0.0000	93.3	1.2	0.9	35923.0	14.67
11623	45552.0944214	307	249	1.8700	2.3200	1.0100	94.9	1.4	1.1	36796.0	4.58
11635	45569.8773651	262	-1	0.4000	0.6800	0.0000	81.4	2.6	-8.3	33279.0	4.10
11635	45614.8944092	327	307	1.5950	1.8400	0.6500	77.3	3.4	-4.9	24378.0	4.77
11661	45560.7947693	326	197	1.9750	2.2900	1.3650	86.2	1.9	15.3	5840.0	6.90
11662	45476.0673523	295	225	1.1750	1.5500	0.7650	96.2	1.2	63.1	38668.0	4.53
11662	45476.0673523	169	-1	0.2500	1.3650	0.0000	96.2	1.2	63.1	38667.0	4.29
11662	45426.0329742	290	248	5.5350	7.5950	3.3350	93.5	5.8	37.7	13504.0	6.43
11662	45426.0330353	298	139	0.7150	0.9200	1.0500	93.5	5.8	37.7	13512.0	14.26
11662	45426.5344543	281	260	4.7050	6.8850	2.8600	92.0	3.5	39.4	14321.0	6.32
11662	45430.5432358	311	268	3.9450	4.8250	1.9400	88.3	0.9	48.9	19799.0	5.53
11662	45431.0442047	295	316	3.8900	5.1450	1.7800	88.2	0.9	51.3	20388.0	5.48
11662	45465.6148682	261	314	0.6800	1.1650	0.4050	85.9	2.3	62.5	39045.0	4.56
11662	45466.1162720	308	264	0.8800	1.0900	0.4450	85.7	2.2	62.4	39030.0	4.64
11662	45521.5965729	287	222	1.5300	2.1400	1.0750	91.6	2.2	45.3	27021.0	4.69
11662	45522.5994110	289	226	1.3950	1.9200	0.9450	90.4	2.8	44.0	25985.0	4.74
11662	45523.6012573	280	350	1.9600	2.8800	0.9200	89.3	2.8	42.7	25037.0	4.67

11662	45524.6026916	290	280	2.6150	3.5800	1.3750	88.1	3.0	41.5	24144.0	4.78
11662	45525.6037140	289	264	3.0200	4.1750	1.7050	87.1	4.1	40.3	23399.0	4.76
11670	45463.3980102	544	-1	1.0200	0.5600	0.0000	88.2	1.5	63.6	38132.0	12.88
11670	45518.5161896	256	273	0.4550	0.8100	0.3200	95.6	1.6	51.8	33511.0	4.54
11670	45610.8247375	241	336	2.1650	4.4100	1.4550	74.4	2.2	45.4	17036.0	4.88
11670	45625.1422729	258	226	0.6850	1.2050	0.5900	84.7	3.2	61.0	31120.0	4.51
11676	45569.1278076	284	255	3.2900	4.6950	1.9900	97.9	1.9	1.1	35064.0	4.60
11676	45601.6567078	273	261	2.5150	3.9100	1.6150	73.5	2.7	1.4	35229.0	4.52
11676	45612.6773987	284	199	3.3100	4.7400	2.7800	75.8	2.4	2.5	35133.0	4.46
11676	45613.6791992	243	295	0.6300	1.2600	0.1900	76.3	2.3	2.4	35130.0	5.70
11684	45405.0621490	233	251	1.3400	2.9650	1.2800	95.0	3.9	-0.5	35904.0	4.46
11684	45405.0621643	294	499	1.3950	1.8550	0.4700	95.0	3.9	-0.5	35900.0	4.41
11684	45405.0621490	203	251	0.9350	2.9650	1.2800	95.0	3.9	-0.5	35912.0	4.50
11684	45499.5577087	261	283	2.2800	3.8850	1.4800	95.0	2.3	2.2	35608.0	4.64
11684	45544.2924042	280	217	1.5450	2.2650	1.1700	88.0	2.1	1.8	35525.0	4.63
11684	45434.0235367	228	-1	1.4250	3.3550	0.0000	88.1	1.2	-1.0	35338.0	4.57
11684	45434.0235596	1534	77	0.9850	0.3050	2.1200	88.1	1.2	-1.0	35335.0	3.89
11684	45484.3111267	274	263	2.9250	4.4900	1.8450	95.6	2.5	1.8	35606.0	4.66
11690	45502.8186798	307	521	1.6350	2.0300	0.5050	80.4	7.3	21.9	19848.0	5.64
11690	45494.1190185	292	463	0.9950	1.3400	0.3550	86.4	3.6	-4.7	19485.0	5.76
11690	45633.3822021	314	257	1.2050	1.4600	0.6150	92.4	6.5	60.2	19825.0	4.62
11705	45471.0260010	304	352	1.8500	2.3250	0.7400	92.2	4.8	-36.7	12134.0	5.35
11705	45471.0259857	861	-1	1.6800	0.6400	0.0000	92.2	4.8	-36.7	12134.0	3.25
11705	45622.1580810	2748	102	1.2000	0.3100	0.8050	100.4	4.3	2.8	14507.0	6.08
11705	45631.0981140	266	452	2.7350	4.4700	1.2000	95.5	7.8	28.5	10034.0	7.28
11708	45409.1108780	336	370	2.3000	2.5500	0.7800	82.7	0.9	0.4	34969.0	4.54
11708	45434.0234604	595	106	0.7850	0.3900	0.9000	88.1	1.2	-1.0	34803.0	3.86
11715	45618.4379272	184	-1	0.1800	0.7600	0.0000	97.5	1.4	-0.7	36624.0	4.58
11718	45383.5582504	264	5391	1.1900	1.9900	0.3350	101.7	10.9	16.0	15306.0	4.98
11718	45607.8816223	387	205	5.7600	4.9300	2.7650	72.7	9.5	-2.7	6534.0	6.54
11728	45385.0550613	291	265	2.8750	3.9150	1.5950	104.1	3.1	0.6	35901.0	4.48
11728	45410.6835327	284	311	3.3000	4.7000	1.6450	83.9	2.8	0.4	35839.0	4.56
11728	45375.2827568	296	283	1.7000	2.2350	0.8500	81.5	2.4	-1.0	35878.0	4.45
11728	45570.4161835	251	235	1.1800	2.1950	1.0250	96.3	1.6	1.3	35730.0	4.58
11728	45562.7238922	260	354	2.5850	4.4500	1.4100	88.6	0.3	-1.4	35697.0	4.64
11728	45518.0243378	359	209	2.8900	2.8850	1.5750	96.9	2.5	2.6	35903.0	4.64
11728	45646.9541321	327	200	2.5900	2.9800	1.7300	92.7	0.9	2.2	35728.0	4.41
11758	45446.1524506	370	149	2.0600	1.9450	1.9000	92.5	1.4	26.3	32741.0	4.48
11758	45432.1189957	261	367	1.5450	2.6300	0.8100	86.8	0.6	39.3	37562.0	4.56
11758	45602.8840027	248	191	2.1500	4.1300	2.5850	74.7	1.5	59.1	32679.0	4.77
11758	45608.8940735	227	199	1.3750	3.2500	1.9000	73.5	1.4	54.0	35737.0	4.69
11762	45601.8828430	332	236	1.4850	1.6800	0.7800	74.2	1.7	62.4	32319.0	4.67
11762	45614.0449524	317	163	0.8800	1.0550	0.8700	77.2	0.7	45.6	37609.0	4.68
11762	45618.1220398	331	262	1.3150	1.4900	0.6150	79.9	0.3	34.8	33943.0	4.77
11762	45654.4229736	261	-1	0.8550	1.4600	0.0000	90.4	9.8	40.6	9115.0	3.63

11762	45654.4229126	359	-1	0.5300	0.5300	0.0000	90.4	9.8	40.6	9112.0	3.59
11762	45654.4229431	232	-1	0.4600	1.0350	0.0000	90.4	9.8	40.6	9105.0	8.86
11783	45565.0491638	306	298	1.7750	2.2100	0.8000	102.6	5.2	-5.7	19674.0	4.57
11783	45523.8511658	343	262	1.8950	2.0400	0.8400	81.9	3.3	-37.5	19500.0	4.74
11783	45610.5045166	287	251	1.5900	2.2250	0.9600	102.4	1.1	-54.4	19545.0	4.76
11791	45380.1051598	412	-1	0.7100	0.5450	0.0000	100.2	1.7	-48.1	8251.0	3.68
11791	45380.1051598	314	165	1.9050	2.3100	1.8600	100.2	1.7	-48.1	8246.0	5.60
11791	45380.1051674	705	-1	1.6400	0.7250	0.0000	100.2	1.7	-48.1	8248.0	12.39
11791	45380.1051598	730	-1	1.5350	0.6600	0.0000	100.2	1.7	-48.1	8244.0	4.57
11791	45525.6047668	265	261	3.5350	5.8550	2.4250	87.4	8.4	39.0	7322.0	9.21
11844	45654.9051208	338	297	3.4100	3.7600	1.3650	98.0	4.4	44.5	37910.0	4.53
11847	45447.2212830	239	182	0.6350	1.3150	0.8850	91.7	2.8	65.8	25014.0	4.90
11847	45495.6129456	290	238	0.6750	0.9250	0.4250	84.3	3.0	38.5	37231.0	4.53
11856	45567.8867798	290	398	2.2950	3.1350	0.9050	79.5	5.1	60.1	28391.0	4.79
11856	45568.8890228	1538	-1	1.3900	0.4300	0.0000	80.7	4.7	61.1	29176.0	13.85
11856	45382.0005188	286	256	1.8150	2.5600	1.0800	81.1	2.0	62.4	29468.0	4.75
11856	45382.5024605	264	284	1.4650	2.4500	0.9300	80.3	2.5	62.7	30057.0	4.71
11856	45433.5464935	236	205	1.1650	2.5150	1.4100	84.5	2.0	53.8	35523.0	4.54
11856	45434.0473251	227	230	1.0800	2.5700	1.2300	84.6	2.3	53.4	35320.0	4.51
11856	45467.5567627	272	280	10.7600	16.8600	6.4900	83.1	5.7	20.8	14367.0	4.97
11856	45608.8957825	261	-1	1.2100	2.0700	0.0000	73.8	1.3	61.5	38660.0	4.58
11861	45405.4800568	242	224	0.4750	0.9650	0.4800	94.5	4.0	64.1	33257.0	4.52
11861	45432.1155624	361	-1	0.4600	0.4550	0.0000	86.9	0.3	57.6	38462.0	3.65
11861	45584.1367340	254	295	1.2900	2.3400	0.2250	63.0	5.1	58.1	26041.0	4.95
11861	45607.6794739	752	174	1.0500	0.4400	0.3200	72.8	1.5	64.1	38777.0	8.66
11861	45644.5937500	274	266	10.4200	16.0450	6.5150	90.4	1.9	8.6	9632.0	7.37
11862	45506.2148743	259	238	1.9050	3.3000	1.5150	94.8	1.9	1.8	35633.0	4.66
11862	45459.1138992	276	534	3.3750	5.1000	1.2550	93.1	2.2	1.1	35769.0	4.62
11862	45462.1954193	283	234	3.1900	4.5800	2.1550	89.6	1.4	1.1	35646.0	4.65
11862	45592.1739197	274	265	1.7500	2.6900	1.0950	115.6	4.0	1.1	35956.0	4.55
11871	45642.9571533	292	-1	0.3550	0.4800	0.0000	90.6	8.1	56.3	11214.0	3.74
11871	45601.3265076	272	265	1.6850	2.6250	1.0700	107.5	4.1	42.7	35972.0	4.39
11871	45610.4194336	251	255	2.4800	4.6150	1.9600	102.2	3.1	18.7	33400.0	4.42
11871	45626.4571228	256	223	13.8300	24.6850	12.3000	99.3	0.7	-26.2	12474.0	4.76
11888	45403.9651489	261	242	0.8550	1.4650	0.6600	91.0	2.9	51.8	32199.0	4.77
11888	45606.1223755	291	-1	0.8000	1.0900	0.0000	104.6	3.6	36.7	37611.0	4.38
11896	45539.8336334	270	196	0.6300	1.0000	0.6000	85.1	3.5	63.5	36874.0	4.64
11896	45495.8872375	292	284	2.8050	3.7750	1.4300	87.8	3.0	58.9	28074.0	4.82
11896	45495.8872223	391	-1	0.6450	0.5400	0.0000	87.8	3.0	58.9	28067.0	5.06
11896	45496.8896942	312	-1	2.2900	2.7950	0.0000	88.9	2.8	59.6	28900.0	4.82
11896	45496.8896942	249	-1	1.6850	3.2100	0.0000	88.9	2.8	59.6	28898.0	4.88
11896	45498.8916016	275	258	2.2750	3.4750	1.4550	91.1	3.2	60.5	30147.0	4.83
11896	45555.8632355	289	241	2.4250	3.3350	1.5100	81.2	4.0	57.2	38262.0	4.65
11896	45563.0144196	154	206	0.3900	2.9200	1.6300	89.1	0.7	20.7	14977.0	6.20
11896	45611.4875183	188	401	1.9850	7.7500	2.2250	100.5	6.1	47.4	19720.0	5.41

11896	45636.4595032	223	186	1.3700	3.3700	2.1950	90.4	4.6	59.2	28857.0	4.76
11909	45511.1329498	431	-1	1.7650	1.2900	0.0000	90.3	2.6	61.9	31611.0	4.77
11909	45542.7687683	386	257	1.2100	1.0450	0.4400	88.6	1.7	62.4	38602.0	4.61
11909	45556.0071106	399	-1	0.4200	0.3350	0.0000	81.5	4.0	62.2	39248.0	5.96
11909	45557.5824127	259	362	0.6850	1.1900	0.3700	82.6	2.3	57.9	38087.0	4.69
11909	45560.7285919	291	462	1.4550	1.9800	0.5250	86.2	1.5	44.3	29403.0	4.95
11909	45587.0010529	249	262	0.6950	1.3250	0.5450	65.3	4.2	63.4	38157.0	4.59
11909	45585.9984436	282	261	0.7350	1.0650	0.4400	64.8	4.2	62.9	38787.0	4.62
11909	45590.0089111	272	-1	0.8800	1.3750	0.0000	67.9	4.0	63.2	34867.0	4.73
11909	45611.2732544	278	254	3.4200	5.1200	2.1850	101.1	6.5	44.8	17933.0	5.49
11909	45615.3515930	274	260	2.4850	3.8250	1.5900	98.3	5.8	48.5	20092.0	5.38
11909	45636.2449951	311	359	1.6800	2.0600	0.6450	91.1	4.9	57.8	27376.0	4.94
11926	45501.0942383	292	262	3.3050	4.4600	1.8400	94.4	3.6	-5.1	37557.0	4.60
11926	45586.9835663	396	-1	0.2950	0.2400	0.0000	64.3	3.1	-11.0	49400.0	4.41
11940	45460.9746323	321	277	1.8100	2.1350	0.8300	92.7	1.5	7.1	35586.0	4.61
11940	45623.6268921	351	381	2.8700	2.9800	0.8900	83.2	1.1	5.9	35049.0	4.48
11941	45545.1509705	277	211	1.3650	2.0600	1.1100	87.4	2.2	2.5	35764.0	4.64
11941	45405.8868103	340	198	2.8850	3.1500	1.8650	94.1	2.6	-0.2	35850.0	4.51
11941	45600.0819397	239	223	0.4350	0.9100	0.4550	73.0	2.7	-0.5	35958.0	4.54
11941	45654.6108093	289	207	2.3750	3.2650	1.8100	97.3	1.6	3.6	35694.0	4.38
11941	45654.0737915	269	275	3.0300	4.8550	1.9000	91.6	0.7	-3.4	35707.0	4.38
11964	45479.6231232	377	163	0.7550	0.6850	0.5600	86.2	2.0	-0.8	35025.0	4.72
11964	45479.6230774	245	-1	0.4400	0.8650	0.0000	86.2	2.0	-0.8	35032.0	5.46
11964	45536.1338043	289	193	0.6500	0.8950	0.5500	97.7	1.8	4.2	35007.0	4.73
11964	45613.6072082	276	228	0.7250	1.1000	0.5350	76.2	2.5	-0.1	35064.0	4.48
11964	45614.6091003	308	-1	0.8150	1.0100	0.0000	77.0	2.4	-0.3	35037.0	4.55
12032	45432.2569885	290	245	3.4100	4.6700	2.0800	86.8	0.8	65.3	21552.0	5.15
12032	45433.2581329	293	229	2.4850	3.3250	1.6000	85.8	2.4	65.2	22418.0	5.10
12032	45434.2602005	293	262	2.8450	3.8050	1.5650	84.3	2.7	64.8	23345.0	5.03
12032	45435.2622223	309	299	4.3300	5.3350	1.9250	83.1	3.0	64.3	24294.0	4.94
12032	45465.2593994	290	223	1.0550	1.4400	0.7200	86.3	2.2	55.0	33968.0	4.60
12032	45648.0362549	298	255	1.2200	1.5800	0.6700	93.7	3.6	47.6	37966.0	4.54
12035	45475.1381378	2417	-1	1.2350	0.2600	0.0000	96.9	1.3	57.0	34268.0	13.49
12035	45464.6144409	250	159	0.4900	0.9200	0.7900	86.7	2.4	56.3	34677.0	4.52
12035	45464.6145019	283	838	0.7650	1.1000	0.2300	86.7	2.4	56.3	34676.0	5.51
12065	45382.5541000	296	195	1.8150	2.3800	1.4350	100.4	5.6	0.1	35938.0	4.38
12065	45476.0076141	292	357	1.8000	2.4300	0.7650	95.9	2.8	0.2	35140.0	4.64
12065	45403.5309677	283	251	1.8900	2.7250	1.1750	91.3	4.4	-0.0	35511.0	4.46
12065	45404.5333023	298	233	1.9050	2.4550	1.1600	92.3	4.5	-0.0	35530.0	4.46
12065	45405.5355682	397	185	1.8200	1.4750	0.9650	93.3	4.4	0.1	35523.0	4.47
12065	45406.5378723	402	223	2.7950	2.2000	1.1000	94.4	4.5	-0.0	35544.0	4.47
12065	45407.5401688	298	167	1.7600	2.2800	1.7900	95.4	4.6	-0.1	35562.0	4.53
12065	45556.0324554	216	-1	0.8450	2.2600	0.0000	90.8	0.5	2.0	34887.0	3.42
12066	45411.4992676	298	204	1.1500	1.4850	0.8400	86.8	0.7	49.9	34423.0	4.47
12066	45412.0004883	270	-1	0.9350	1.4800	0.0000	86.9	0.7	49.4	34165.0	4.43

12066 45590.7918091	297	249	2.2950	2.9750	1.3000	66.9	3.6	64.1	36124.0	4.71
12070 45524.2324524	275	236	2.1250	3.2450	1.5100	82.6	5.2	54.8	21444.0	5.03
12070 45564.0938110	298	264	1.1350	1.4700	0.6000	90.9	3.1	63.7	37780.0	4.55
12070 45593.6536255	278	226	0.8950	1.3350	0.6550	68.8	2.8	63.2	38263.0	4.78
12070 45597.8027649	270	222	0.8200	1.2950	0.6500	71.3	2.1	57.4	38613.0	4.66
12070 45604.0256042	268	244	1.2650	2.0350	0.9100	75.2	1.6	41.0	28653.0	4.94
12070 45607.6029968	286	228	1.6200	2.2800	1.1050	72.3	2.3	38.1	26843.0	5.04
12070 45585.9264221	148	107	0.5000	4.3100	9.6450	64.3	5.0	63.0	30811.0	8.70
12070 45585.9264221	290	-1	0.4300	0.5900	0.0000	64.3	5.0	63.0	30811.0	3.61
12078 45537.5422516	378	170	0.5100	0.4600	0.3500	81.7	3.6	35.8	37948.0	8.16
12078 45538.6074676	253	226	1.8450	3.3850	1.6650	82.9	3.2	25.8	37598.0	4.64
12078 45531.0946808	856	-1	2.1200	0.8100	0.0000	90.5	1.4	31.0	38012.0	3.74
12078 45532.6649475	248	237	1.3950	2.6850	1.2400	91.6	3.2	18.9	35039.0	4.70
12078 45582.7814178	225	295	3.1700	7.6500	0.9700	62.4	6.5	60.0	22576.0	5.23
12086 45530.0973053	271	230	0.8400	1.3200	0.6350	89.6	1.5	47.3	34422.0	4.76
12120 45470.1041107	278	270	3.9350	5.8800	2.3450	91.4	0.1	-1.3	34903.0	4.68
12120 45529.0852203	296	494	2.2700	2.9800	0.7600	88.2	0.2	-1.9	34857.0	4.63
12120 45525.0748596	295	281	2.4650	3.2500	1.2450	83.7	2.4	-1.8	35042.0	4.72
12120 45526.0775299	290	240	3.9400	5.3950	2.4550	84.7	1.7	-1.9	34951.0	4.67
12120 45527.0801239	362	153	1.3700	1.3450	1.2550	85.8	1.1	-1.8	34893.0	4.66
12120 45644.0201416	286	236	1.6000	2.2550	1.0500	90.7	0.7	1.4	34873.0	4.42
12120 45645.0219421	286	262	3.8500	5.4150	2.2350	91.7	0.8	1.4	34874.0	4.44
12133 45498.0534058	275	-1	0.6100	0.9300	0.0000	97.4	8.3	11.3	6563.0	15.84
12133 45511.1420136	267	272	1.4600	2.3700	0.9400	88.8	2.8	62.0	33255.0	4.79
12133 45555.5906830	367	-1	0.7400	0.7100	0.0000	89.1	1.7	62.5	38075.0	3.77
12134 45498.4129639	289	229	23.7200	32.7500	15.8350	96.5	8.9	4.2	5251.0	12.61
12134 45508.1382141	524	235	1.0550	0.6000	0.2800	92.5	2.5	52.7	22914.0	9.08
12134 45496.4020691	340	241	4.5650	4.9800	2.2600	83.8	6.4	33.6	12672.0	6.88
12134 45639.1094971	274	273	1.0500	1.6100	0.6350	89.9	3.8	46.3	30572.0	4.47
12134 45653.4255981	265	243	4.9450	8.1900	3.6800	91.7	4.6	17.8	13791.0	4.72
12156 45414.9909515	285	254	1.7250	2.4550	1.0450	88.2	3.0	55.3	24494.0	4.72
12156 45533.5592194	267	378	39.3600	64.1300	19.3000	100.5	11.4	-6.1	4021.0	16.11
12156 45572.5535431	396	157	1.1400	0.9250	0.8150	91.9	1.1	60.0	29565.0	4.89
12156 45587.1487274	296	375	2.3500	3.0900	0.9350	66.4	3.2	59.9	37998.0	4.55
12156 45587.6474457	695	-1	0.9500	0.4250	0.0000	66.3	4.3	59.5	38286.0	3.25
12156 45595.4551086	291	259	2.9700	4.0500	1.6900	111.1	6.0	55.2	25287.0	4.95
12159 45510.9184265	315	187	0.7550	0.9100	0.5900	90.0	2.2	61.7	38383.0	4.66
12159 45512.9907837	286	186	0.6100	0.8600	0.5600	92.4	3.2	58.9	38687.0	4.62
12159 45535.5331879	263	243	4.2950	7.2450	3.2500	79.2	7.2	15.9	14572.0	6.38
12159 45396.9485283	271	295	2.2500	3.5500	0.2400	92.4	5.2	50.6	20786.0	4.52
12159 45526.2385864	253	250	0.5800	1.0600	0.4600	85.1	4.2	55.1	37432.0	4.64
12159 45553.4456940	256	208	1.1450	2.0500	1.1300	92.3	1.7	51.9	21909.0	5.39
12159 45556.5212860	279	251	0.9500	1.4100	0.6100	88.3	1.9	57.9	27092.0	5.03
12159 45579.0590973	258	283	0.5350	0.9350	0.3550	62.0	4.5	57.4	38504.0	4.64
12159 45586.1462860	269	176	0.5000	0.8000	0.5700	65.5	3.4	59.8	38755.0	4.64

12159	45615.4923401	235	238	0.4600	1.0000	0.4600	97.1	4.3	61.8	32198.0	4.59
12159	45641.4677734	482	153	0.6750	0.4250	0.3500	87.5	3.6	62.9	37542.0	4.44
12295	45439.1361542	303	236	0.7700	0.9700	0.4500	94.1	3.2	26.4	23194.0	4.97
12295	45515.5229034	340	-1	0.4800	0.5250	0.0000	99.0	4.0	-14.5	26752.0	4.75
12303	45436.0399094	353	162	3.2250	3.3250	2.7550	89.6	1.4	57.8	26888.0	5.00
12303	45469.8914337	260	257	3.2650	5.6450	2.3800	90.8	0.4	9.4	27218.0	4.97
12303	45557.0215301	242	211	3.2500	6.5900	3.5400	88.4	1.9	59.3	26030.0	4.85
12309	45437.6036453	292	208	1.8400	2.4850	1.3700	91.8	0.6	-0.0	34906.0	4.66
12309	45433.5936584	285	108	2.1600	3.0700	6.6200	87.2	1.8	0.0	34993.0	4.57
12309	45434.5964432	289	-1	2.0250	2.8000	0.0000	88.5	1.2	0.0	34937.0	4.62
12309	45435.5991821	319	232	2.1100	2.5050	1.1900	89.8	0.6	-0.0	34905.0	4.62
12309	45526.1128693	285	273	1.8500	2.6200	1.0350	87.2	2.3	0.3	35063.0	4.65
12309	45548.0861816	321	236	2.0200	2.3800	1.1050	99.3	2.3	0.1	35086.0	4.63
12309	45549.0883484	262	295	1.7650	2.9950	1.0950	98.5	2.1	0.2	35023.0	4.64
12311	45435.8249435	258	232	1.2200	2.1400	1.0150	88.8	1.7	57.6	27126.0	4.99
12311	45468.8177948	271	255	1.3100	2.0600	0.8750	89.5	1.0	12.0	28242.0	4.98
12311	45555.5199127	247	187	0.5450	1.0550	0.6800	89.5	2.3	61.3	25942.0	4.84
12311	45633.4625244	266	224	1.0500	1.7200	0.8550	94.0	2.4	13.7	29003.0	4.44
12339	45409.6096039	262	676	1.5050	2.5400	0.5700	82.9	2.8	-0.1	35128.0	4.39
12339	45410.6118393	264	234	1.4050	2.3400	1.1000	84.0	2.8	-0.2	35126.0	4.54
12339	45418.6309662	364	144	1.2350	1.2050	1.2650	93.5	2.0	-0.1	35000.0	4.58
12339	45507.6110382	262	234	1.3450	2.2800	1.0700	85.8	1.9	-0.3	34984.0	4.65
12339	45507.6109924	381	302	1.0700	0.9500	0.3400	85.8	1.9	-0.3	34989.0	3.83
12339	45550.6264801	241	251	1.0250	2.0900	0.9050	89.5	2.5	-0.1	35049.0	4.65
12339	45380.1512337	220	311	0.8950	2.2850	0.8000	80.4	2.6	0.2	35099.0	4.48
12339	45428.1172790	260	218	1.1900	2.0450	1.0500	91.1	1.3	0.1	34932.0	4.61
12339	45432.1262665	257	389	1.1400	2.0250	0.5950	86.7	1.4	0.0	34936.0	4.71
12339	45466.1289673	265	192	1.1850	1.9600	1.2100	85.2	2.5	0.1	35080.0	4.66
12339	45600.5829468	251	278	1.4650	2.7400	1.0600	72.5	2.9	0.0	35147.0	4.55
12339	45601.5848694	291	237	1.8600	2.5250	1.1700	73.5	2.7	-0.1	35121.0	4.56
12363	45464.4794922	317	320	8.0650	9.6750	3.3100	86.6	2.7	20.0	21070.0	5.15
12368	45404.0273819	282	245	16.1250	23.3000	10.3600	92.3	3.2	0.1	8473.0	8.28
12368	45435.5492630	317	237	2.7950	3.3450	1.5500	82.7	3.1	60.3	25307.0	5.09
12368	45436.0501251	287	201	2.5950	3.6200	2.0900	82.6	3.3	60.6	25798.0	5.00
12368	45462.5397034	318	189	1.2000	1.4300	0.9050	89.3	1.7	63.6	35527.0	4.66
12368	45462.5397034	248	313	0.5700	1.0900	0.3800	89.3	1.7	63.6	35529.0	4.61
12368	45463.0407715	257	276	0.8500	1.5100	0.5900	89.2	1.7	63.5	35756.0	4.64
12368	45645.0335693	481	169	1.1800	0.7450	0.5700	91.9	3.7	61.3	39161.0	4.47
12371	45480.9124908	316	418	1.3650	1.6400	0.4600	87.9	1.1	-0.0	34570.0	4.66
12371	45513.0860748	337	262	1.7800	1.9650	0.8100	86.8	2.3	0.2	34845.0	4.66
12371	45513.0860290	242	-1	0.5850	1.1800	0.0000	86.8	2.3	0.2	34855.0	12.04
12371	45576.8236847	250	225	0.7700	1.4450	0.7150	58.3	4.9	-0.1	35367.0	4.62
12376	45498.1034088	280	232	2.4150	3.5350	1.6750	90.4	2.1	43.6	36327.0	4.70
12376	45498.6023865	289	313	2.6000	3.5750	1.2450	90.4	1.8	43.5	36329.0	4.70
12376	45499.6716766	288	323	3.1150	4.3200	1.4700	92.2	2.6	32.4	37678.0	4.64

12376	45499.6716766	365	295	2.6200	2.5450	0.3400	92.2	2.6	32.4	37684.0	4.78
12376	45500.7415619	378	267	4.6000	4.1650	1.6850	93.6	3.9	19.8	33444.0	4.71
12376	45635.5292053	283	255	2.4000	3.4550	1.4650	91.1	5.0	59.1	26647.0	4.56
12376	45647.0522461	279	418	1.6600	2.4600	0.6900	84.5	3.3	48.7	34284.0	4.38
12383	45519.5187378	245	227	0.4500	0.8900	0.4350	94.2	1.8	48.8	35414.0	4.46
12383	45639.9532165	267	220	0.9600	1.5650	0.7950	88.3	3.2	63.7	37040.0	4.47
12384	45404.9686890	142	295	0.5450	5.3900	0.2700	91.7	7.4	62.6	14923.0	4.36
12384	45495.9570923	298	326	1.1950	1.5400	0.5200	88.2	2.5	50.6	31865.0	4.86
12384	45635.4579773	255	241	0.9400	1.7000	0.7700	91.0	4.9	59.6	27267.0	4.54
12445	45557.7104492	367	295	30.2400	29.0400	1.7700	82.5	5.4	-14.4	7852.0	8.05
12447	45512.0490723	294	239	3.2250	4.2900	1.9600	91.4	1.1	-2.0	35000.0	4.69
12447	45482.4507141	396	333	4.0850	3.3300	1.1050	88.1	1.3	1.8	35036.0	4.67
12447	45437.8175659	379	168	2.4500	2.2000	1.7050	92.4	1.4	-0.7	35027.0	4.63
12447	45392.1761589	382	162	1.5050	1.3300	1.1100	94.4	2.9	-0.9	35227.0	4.50
12471	45536.9557342	307	271	4.7400	5.8800	2.3400	81.7	2.9	-1.8	34973.0	4.64
12471	45438.0315170	375	189	2.4600	2.2600	1.4300	92.9	2.2	-0.5	34736.0	4.59
12471	45564.1888428	228	218	1.1100	2.6050	1.3400	88.4	2.4	1.1	34678.0	4.65
12474	45378.1114883	261	335	1.6750	2.8550	0.9450	100.1	3.0	0.1	35147.0	4.46
12474	45419.5957794	257	236	1.1500	2.0300	0.9450	84.7	3.5	0.8	35278.0	4.51
12474	45506.5732574	286	212	1.2850	1.8100	0.9700	93.8	1.7	0.1	34980.0	4.64
12474	45486.0643463	271	232	1.7100	2.6900	1.2750	84.3	3.3	-0.1	35250.0	4.60
12474	45553.0596771	284	249	2.0000	2.8550	1.2450	77.4	3.3	-3.5	35245.0	4.66
12474	45554.0617981	268	232	1.7650	2.8500	1.3500	78.6	3.1	-0.1	35200.0	4.63
12474	45554.0618591	335	-1	0.4400	0.4900	0.0000	78.6	3.1	-0.1	35189.0	4.03
12512	45504.0587921	270	251	3.1500	4.9850	2.1550	97.2	2.5	46.8	18798.0	5.66
12512	45467.8961945	299	-1	0.5400	0.6900	0.0000	87.4	2.5	58.2	37808.0	17.32
12512	45628.4460754	269	273	3.2500	5.1800	2.0450	95.8	4.2	52.9	34421.0	4.48
12519	45636.2476501	214	-1	0.5600	1.5350	0.0000	91.6	4.1	43.6	28491.0	4.33
12545	45536.8844757	339	705	4.9200	5.4000	1.1950	81.4	2.9	-0.5	35348.0	4.65
12545	45541.8967895	250	173	0.3900	0.7350	0.5400	86.9	0.2	-0.9	35074.0	3.77
12546	45500.0605926	317	179	0.4050	0.4850	0.3350	95.0	2.8	-6.1	29106.0	4.79
12547	45541.2849274	271	317	1.3450	2.1150	0.7300	91.9	1.1	20.8	31970.0	4.49
12547	45506.2050781	269	582	1.1650	1.8600	0.4400	94.7	1.7	51.0	34392.0	4.55
12547	45506.2050781	217	696	0.4050	1.0800	0.2400	94.7	1.7	51.0	34392.0	3.19
12556	45425.4555435	290	248	1.2450	1.7000	0.7450	93.8	2.6	63.0	29339.0	4.80
12556	45522.0345306	364	295	37.3150	36.4200	5.1800	92.3	0.8	2.8	8525.0	5.63
12561	45381.1220245	292	315	1.4400	1.9450	0.6750	100.1	5.4	10.9	26921.0	4.94
12561	45385.6305389	287	276	1.2250	1.7150	0.6700	89.8	1.9	15.3	29104.0	4.93
12561	45386.1354942	250	491	1.0200	1.9150	0.4900	91.0	4.9	14.8	29241.0	4.84
12561	45504.0570373	272	-1	0.7550	1.1800	0.0000	97.2	1.6	54.6	33158.0	11.38
12561	45504.0570373	254	285	0.5850	1.0600	0.4000	97.2	1.6	54.6	33158.0	4.58
12561	45510.1444855	351	233	0.6750	0.7000	0.3300	90.2	2.2	47.0	37381.0	4.47
12561	45538.4188690	275	265	0.7250	1.1050	0.4500	94.5	1.2	28.9	35501.0	4.41
12561	45543.5026550	252	1382	0.9450	1.7500	0.3350	89.0	1.8	17.9	29419.0	4.62
12561	45393.7171478	266	215	1.9400	3.1750	1.6650	89.0	2.7	2.2	21296.0	5.30

12561	45495.5388641	623	-1	0.7900	0.3800	0.0000	84.3	3.1	50.5	36110.0	4.37
12561	45554.0986328	255	234	1.3800	2.4850	1.1700	92.5	0.5	7.4	23013.0	4.67
12561	45654.9073791	757	-1	0.8400	0.3500	0.0000	98.3	5.3	55.0	35320.0	5.01
12561	45583.3033600	243	259	3.4700	6.9400	2.8900	116.3	8.8	-16.8	12273.0	5.06
12562	45572.6358795	264	285	3.1900	5.3300	2.0150	93.5	0.3	3.4	23650.0	5.04
12562	45611.5661011	253	388	1.4500	2.6500	0.7800	101.6	3.2	9.7	26142.0	4.79
12562	45634.3935242	359	429	6.7450	6.7250	1.8600	93.6	2.1	9.7	27218.0	4.65
12563	45394.5316162	266	200	3.1450	5.1500	2.9950	91.2	4.4	45.8	13758.0	6.10
12563	45494.0396881	620	-1	1.1400	0.5500	0.0000	86.6	3.5	33.7	23735.0	3.50
12563	45595.8705139	326	103	0.4500	0.5200	1.3000	70.1	3.8	56.9	21960.0	6.57
12563	45628.5770264	305	226	0.9700	1.2150	0.5950	85.0	2.7	59.1	39874.0	4.50
12563	45621.9200439	280	276	0.9300	1.3700	0.5350	82.3	1.3	63.6	38168.0	4.57
12564	45510.9768066	263	222	1.3900	2.3350	1.1700	90.2	0.4	-0.8	34878.0	4.70
12564	45534.9518280	274	245	2.0000	3.0750	1.3650	79.3	3.3	-1.0	35218.0	4.62
12564	45595.9312134	277	240	2.4350	3.6500	1.6600	69.9	3.2	-0.4	35211.0	4.56
12564	45596.9331360	290	227	2.3950	3.2850	1.6000	70.9	3.1	-0.3	35180.0	4.58
12627	45505.9020081	290	-1	1.8750	2.5700	0.0000	84.2	4.4	46.6	36210.0	4.64
12627	45495.7417602	252	248	1.5100	2.7900	1.2250	87.2	3.7	56.6	28862.0	4.97
12627	45525.4567871	267	262	11.4950	18.7100	7.6950	87.2	5.7	60.9	13745.0	6.55
12627	45623.4351501	636	190	1.3050	0.6200	0.3900	97.0	6.3	62.5	22713.0	8.56
12627	45481.5722809	252	243	2.3200	4.2800	1.9200	87.5	3.6	61.8	22908.0	5.30
12677	45498.3410187	384	344	0.6000	0.5250	0.1700	97.0	2.7	0.5	35132.0	4.43
12677	45498.3410187	369	-1	0.6000	0.5700	0.0000	97.0	2.7	0.5	35126.0	4.45
12677	45537.3505707	302	-1	0.6250	0.7900	0.0000	96.4	1.8	0.5	34994.0	4.63
12677	45563.8675690	283	234	0.6150	0.8850	0.4150	89.7	1.8	-0.4	34993.0	4.59
12679	45419.6882019	297	337	0.5850	0.7600	0.2500	94.1	1.9	-83.1	22525.0	5.11
12679	45475.5298462	301	168	0.6000	0.7600	0.5900	81.4	5.3	-57.1	22456.0	5.32
12679	45393.9152260	453	-1	1.0600	0.7300	0.0000	88.8	4.5	-84.8	22700.0	4.94
12679	45403.0802994	315	280	0.6450	0.7800	0.3000	90.5	3.8	-88.6	22639.0	5.02
12679	45492.6479034	278	393	1.1250	1.6800	0.4900	78.5	5.5	-16.3	13431.0	6.48
12679	45482.0538025	318	381	1.0650	1.2700	0.3800	89.5	1.3	-23.5	14355.0	6.36
12680	45382.7761726	254	270	4.0800	7.4400	2.9700	100.3	10.0	62.5	15721.0	5.00
12680	45637.3186035	260	295	1.1250	1.9400	0.7100	90.1	4.5	56.7	28627.0	4.53
12787	45384.3718224	297	207	2.8550	3.7200	2.0550	77.8	3.8	18.8	14507.0	5.65
12787	45462.3338318	299	245	0.6750	0.8650	0.3850	89.5	0.5	18.9	33426.0	4.53
12787	45484.2381134	279	247	0.6800	1.0100	0.4450	95.6	2.5	8.9	32477.0	4.56
12787	45493.1166840	291	214	0.9400	1.2800	0.6750	87.7	1.7	0.0	27171.0	4.75
12787	45497.3396149	263	254	1.1700	1.9700	0.8400	82.7	3.7	-4.4	23953.0	4.78
12810	45393.5364494	331	204	0.8100	0.9200	0.5200	92.4	3.3	0.5	28617.0	4.46
12810	45393.5365295	255	-1	0.3750	0.6750	0.0000	92.4	3.3	0.5	28608.0	4.79
12810	45430.4047928	287	303	0.5000	0.7000	0.2500	88.3	0.6	24.9	23285.0	5.08
12810	45430.4047470	387	-1	0.9800	0.8400	0.0000	88.3	0.6	24.9	23289.0	9.30
12810	45434.4106522	359	371	1.1800	1.1800	0.3600	83.6	4.1	27.0	20623.0	5.15
12810	45434.4106598	209	-1	0.3300	0.9650	0.0000	83.6	4.1	27.0	20618.0	3.17
12815	45570.2718811	271	-1	0.4850	0.7650	0.0000	96.6	2.1	6.9	26704.0	9.16

12815	45488.3081512	1547	-1	2.2200	0.6850	0.0000	85.9	3.4	57.5	27665.0	12.14
12817	45447.1266785	286	188	0.6350	0.8950	0.5750	87.9	4.1	-5.6	20832.0	5.43
12818	45436.8917541	217	240	21.4100	56.8700	25.8400	91.0	1.1	18.3	9466.0	7.76
12827	45413.5623398	270	2169	5.8100	9.2300	1.6450	86.2	4.9	55.0	12796.0	6.53
12827	45416.8522110	268	264	5.9550	9.6400	3.9400	90.4	3.5	49.5	12872.0	6.47
12827	45416.8521652	10000	208	3.1400	0.5200	0.2850	90.4	3.5	49.5	12875.0	19.19
12827	45542.0714569	268	267	6.0450	9.7300	3.9300	91.1	3.5	25.0	10770.0	5.49
12833	45550.1405792	270	268	4.4200	7.0000	2.8150	90.4	1.6	62.3	20813.0	5.09
12833	45421.1599197	253	220	1.5050	2.7600	1.4050	83.4	2.6	57.2	36805.0	4.43
12833	45477.0095825	250	505	12.1300	22.8300	5.7550	94.8	5.0	3.2	15665.0	4.80
12833	45375.3417854	260	261	3.6100	6.2200	2.5700	81.2	3.5	65.6	22310.0	4.96
12833	45425.0976639	263	253	2.7500	4.6150	1.9750	94.7	2.5	62.2	34651.0	4.48
12834	45437.1057663	280	-1	0.5200	0.7650	0.0000	91.6	1.0	17.5	33082.0	4.86
12834	45434.5358200	701	-1	0.6300	0.2800	0.0000	87.9	3.6	30.6	37521.0	3.30
12834	45609.3449707	376	228	0.5200	0.4750	0.2300	102.8	3.2	24.3	35714.0	4.42
12834	45615.4316101	287	193	0.7600	1.0600	0.6500	99.6	2.5	3.1	25436.0	4.49
12850	45539.6049042	314	269	4.7050	5.6950	2.2800	84.4	1.8	-1.7	35817.0	4.64
12850	45538.0660553	260	217	1.4400	2.4750	1.2800	95.8	1.8	1.3	35647.0	4.66
12850	45603.6929626	266	201	1.2950	2.1300	1.2300	119.8	5.6	0.8	36639.0	4.54
12850	45439.0329437	1475	284	3.6900	1.1600	0.4400	94.0	3.0	-0.5	35891.0	3.73
12851	45379.6137619	403	205	4.6600	3.6500	2.0450	98.7	2.3	0.6	34845.0	4.47
12851	45506.1433105	423	374	2.1600	1.6150	0.4900	94.8	2.0	1.4	34830.0	4.80
12851	45492.2614746	464	158	2.8050	1.8700	1.6250	88.5	3.0	1.3	34978.0	4.72
12851	45461.4778900	294	292	3.4450	4.5900	1.6950	90.2	0.5	0.8	34676.0	4.66
12851	45649.6015015	281	240	2.2350	3.2700	1.4900	93.8	1.0	1.2	34714.0	4.41
12851	45576.5734100	256	216	1.4600	2.6100	1.3600	118.7	4.4	1.2	35354.0	4.62
12897	45418.5232696	273	224	0.9750	1.5100	0.7500	86.0	2.2	1.2	35033.0	4.57
12897	45469.4936676	288	293	1.6850	2.3400	0.8600	96.2	2.7	0.8	35092.0	4.62
12897	45505.4991760	304	248	1.6650	2.0900	0.9150	95.3	2.0	1.2	35044.0	4.68
12897	45530.0161133	314	272	1.4350	1.7400	0.6900	89.0	0.6	-1.2	34909.0	4.70
12906	45411.8286438	299	286	0.8500	1.0900	0.4100	85.5	4.0	-3.7	20179.0	5.48
12906	45413.8321991	315	167	1.0300	1.2450	0.9800	87.8	3.5	-12.1	16656.0	5.90
12906	45505.4876251	301	204	0.4450	0.5650	0.3200	95.3	1.9	58.7	30586.0	4.67
12906	45487.5921020	460	162	0.5200	0.3500	0.2900	86.2	3.1	59.6	29950.0	10.19
12907	45520.0882568	239	251	0.6800	1.4100	0.6100	93.8	2.9	63.7	20291.0	10.07
12907	45521.0909729	274	226	0.6650	1.0200	0.5000	92.8	2.8	63.5	20930.0	5.38
12907	45522.5951386	293	-1	0.6400	0.8600	0.0000	90.3	3.8	62.8	22231.0	7.99
12907	45522.5951843	384	-1	0.3550	0.3100	0.0000	90.3	3.8	62.8	22245.0	3.40
12907	45523.5967865	300	-1	0.6600	0.8400	0.0000	89.2	3.7	62.6	22776.0	4.96
12907	45525.0989838	289	-1	0.5800	0.8000	0.0000	88.0	3.6	61.9	23526.0	5.09
12908	45440.0728226	533	193	86.5150	48.3750	29.6850	93.4	8.3	-1.8	7093.0	8.37
12908	45580.0846863	382	295	437.1500	386.3300	57.0600	117.1	18.5	-26.3	2445.0	15.20
12915	45446.0040436	507	387	1.5050	0.8800	0.2600	93.1	1.8	49.9	35716.0	11.28
12915	45400.4691849	293	180	0.9800	1.3100	0.9000	84.5	2.5	63.9	33452.0	4.59
12915	45461.0416717	265	-1	0.5700	0.9450	0.0000	91.1	0.8	33.6	24149.0	14.75

12915	45461.5435257	285	243	1.8750	2.6600	1.1950	90.2	0.8	32.4	23443.0	4.72
12915	45463.0476837	284	250	2.0400	2.9200	1.2650	88.8	1.4	29.4	21545.0	4.75
12915	45464.0493927	250	249	2.1050	3.9700	1.7300	87.8	1.5	27.6	20441.0	4.79
12915	45465.0508423	282	279	3.6050	5.2300	2.0200	86.7	3.2	25.7	19426.0	4.81
12915	45466.0530090	338	262	5.6950	6.2600	2.5800	85.2	4.5	23.1	18189.0	4.81
12915	45466.5545807	289	272	6.4850	8.9400	3.5350	84.0	4.4	21.7	17335.0	4.87
12915	45611.9006653	294	226	1.1300	1.5000	0.7350	75.9	0.9	59.4	38494.0	4.64
12915	45622.9897766	397	-1	1.1600	0.9400	0.0000	83.0	0.9	43.4	30632.0	8.31
12919	45596.5650024	464	-1	0.5850	0.3900	0.0000	71.7	17.9	-51.8	2796.0	4.73
12920	45395.4599075	265	208	0.8550	1.4100	0.7750	90.4	2.9	62.6	28229.0	4.78
12920	45456.3136902	304	219	0.9550	1.2000	0.6150	96.2	1.9	44.7	33000.0	4.51
12933	45530.6017151	133	-1	0.5650	7.2300	0.0000	89.6	3.4	62.5	17677.0	3.82
12933	45556.5788879	389	194	1.9050	1.6200	0.9900	81.6	3.4	53.1	28919.0	4.96
12933	45395.2513924	286	229	0.6050	0.8500	0.4100	90.5	1.1	26.7	37159.0	4.25
12933	45584.7681580	295	737	5.3050	7.0000	1.5250	62.2	5.4	5.7	27032.0	5.05
12940	45566.6661835	628	187	0.7100	0.3400	0.2200	77.4	4.2	43.5	37146.0	19.00
12940	45567.7380676	270	222	0.5350	0.8450	0.4250	78.8	3.4	33.9	39050.0	4.58
12940	45561.2315979	327	745	1.1200	1.2900	0.2800	86.8	3.8	30.8	38794.0	5.81
12940	45592.5628052	272	232	7.2800	11.3850	5.4150	67.8	9.5	-24.9	11073.0	7.20
12940	45582.1338348	256	293	1.0450	1.8600	0.6850	61.6	6.5	60.3	23361.0	5.18
12959	45375.6165085	335	228	1.1550	1.2900	0.6250	98.2	5.0	62.5	39040.0	4.43
12959	45470.9709930	339	264	1.1600	1.2700	0.5200	91.5	3.2	48.5	30881.0	4.97
12959	45485.9982147	234	270	3.1200	6.8250	2.7250	84.1	7.6	24.5	15696.0	5.90
12959	45604.4000854	280	232	1.0600	1.5550	0.7400	104.7	4.1	61.9	39193.0	4.38
12959	45605.4020081	293	242	1.1150	1.4950	0.6750	104.0	4.0	61.8	39232.0	4.39
12959	45606.4039612	275	429	0.9200	1.4100	0.3900	103.5	4.0	61.6	39243.0	4.38
12959	45607.4058533	275	226	1.0200	1.5600	0.7650	102.9	4.0	61.4	39227.0	4.37
12959	45623.4367065	267	318	0.8500	1.3800	0.4750	97.6	4.2	54.3	35379.0	4.44
12967	45515.6254730	277	234	0.9350	1.4050	0.6600	94.6	3.8	-0.2	35344.0	4.60
12967	45539.6051178	298	215	1.0500	1.3550	0.7100	84.4	1.9	-1.7	34989.0	4.68
12967	45540.6076813	304	236	1.2200	1.5300	0.7100	85.2	1.2	-2.6	34926.0	4.66
12967	45376.1417580	339	247	2.2000	2.4100	1.0600	80.5	2.6	-0.1	35095.0	4.47
12967	45516.0924988	339	300	0.7350	0.8050	0.2900	99.0	2.7	0.1	35120.0	4.64
12984	45475.7615967	298	310	0.8200	1.0550	0.3700	81.8	4.2	24.9	35606.0	4.67
12984	45476.8318176	318	281	1.8900	2.2600	0.8650	83.1	4.4	5.8	25590.0	5.04
12984	45572.2672424	267	185	0.7150	1.1600	0.7600	92.5	0.8	58.6	26549.0	4.76
12984	45625.1562195	307	376	0.6400	0.7950	0.2400	97.3	3.7	43.2	36391.0	4.38
12984	45632.1723022	342	-1	0.9800	1.0600	0.0000	94.7	2.8	25.2	35044.0	8.60
12986	45506.3464203	237	200	0.5600	1.1900	0.6900	94.3	2.3	58.9	27724.0	4.99
12986	45506.3464203	352	-1	0.8400	0.8700	0.0000	94.3	2.3	58.9	27727.0	3.42
12986	45609.4100647	282	815	0.5250	0.7600	0.1600	101.4	3.9	59.4	37979.0	4.27
12993	45521.0223846	279	286	5.7950	8.6100	3.2400	93.3	4.7	49.6	8319.0	8.83
12993	45614.0607910	291	766	1.4400	1.9550	0.4200	98.5	6.2	63.1	21060.0	4.98
13001	45611.5045776	293	170	0.5000	0.6700	0.5100	102.2	3.2	-43.4	751.0	8.16
13007	45643.0146484	10000	396	7.4850	0.6900	0.2000	90.7	3.1	-17.4	17439.0	5.46

13011	45462.4786224	364	724	0.7500	0.7300	0.1600	89.0	0.5	10.7	23087.0	5.04
13012	45543.9124756	310	295	0.7250	0.8900	0.3250	89.6	1.4	56.9	37192.0	4.68
13012	45569.5571594	452	167	37.2200	25.7050	20.1400	97.0	6.3	5.3	5056.0	12.95
13012	45556.9344177	291	246	1.0150	1.3800	0.6100	82.4	4.0	48.6	32475.0	4.77
13012	45578.9716339	323	326	32.7350	38.3750	12.9450	60.2	11.1	7.7	10890.0	7.41
13012	45579.8413238	315	323	3.2150	3.8850	1.3200	60.8	4.6	51.9	34882.0	4.79
13012	45582.7765655	294	311	2.6300	3.5100	1.2300	61.6	4.6	58.2	38388.0	4.63
13012	45583.9754028	624	97	0.9150	0.4400	1.3500	62.5	17.2	-23.4	4266.0	14.14
13012	45583.9754181	738	-1	0.5400	0.2300	0.0000	62.5	17.2	-23.4	4259.0	6.49
13016	45499.6067200	401	-1	0.6200	0.4900	0.0000	91.8	3.8	61.4	30688.0	4.58
13016	45529.5997772	314	132	0.5700	0.6900	0.8800	88.5	2.3	62.9	35835.0	4.76
13025	45477.4381256	251	314	2.5700	4.7800	1.6600	93.6	2.3	9.0	28348.0	4.77
13025	45378.1469154	378	622	14.8000	13.3750	3.0850	80.2	4.2	-2.5	20497.0	4.97
13025	45463.0513611	484	182	4.3250	2.7000	1.8250	89.0	0.4	10.4	28649.0	4.80
13025	45487.5319366	269	225	3.0950	4.9650	2.4450	86.1	2.2	6.4	25395.0	4.90
13035	45423.9632645	328	315	1.3300	1.5300	0.5300	97.3	3.4	0.0	35259.0	4.56
13060	45590.7873535	274	302	2.2750	3.4900	1.2500	66.6	8.9	46.5	9323.0	7.06
13069	45384.5581055	298	258	1.7350	2.2450	0.9400	103.1	5.3	-0.1	35816.0	4.45
13069	45384.5581512	480	-1	1.0100	0.6400	0.0000	103.1	5.3	-0.1	35824.0	14.55
13069	45446.0133591	282	234	1.5450	2.2400	1.0550	93.0	2.6	0.1	35095.0	4.61
13069	45447.0162659	306	344	1.6100	2.0050	0.6500	91.7	1.9	0.1	34986.0	4.62
13069	45480.0179901	286	280	1.6700	2.3450	0.9000	91.2	0.6	2.1	34901.0	4.63
13069	45481.0205688	284	214	1.6300	2.3300	1.2300	90.2	0.2	0.2	34884.0	4.66
13069	45423.5050201	320	197	2.9050	3.4450	2.0450	82.2	4.0	-0.0	35411.0	4.56
13069	45423.5050201	257	-1	2.1150	3.7300	0.0000	82.2	4.0	-0.0	35406.0	4.61
13069	45423.5050430	254	224	1.3750	2.5100	1.2500	82.2	4.0	-0.0	35417.0	4.51
13069	45496.5223694	269	215	1.5550	2.4850	1.3050	88.5	4.4	-0.1	35513.0	4.60
13069	45497.5244141	286	297	1.6150	2.2750	0.8250	89.2	4.4	-0.2	35627.0	4.57
13070	45434.0475922	295	297	1.2400	1.6400	0.5950	84.6	2.4	53.5	34351.0	4.57
13070	45468.0582428	537	208	12.1250	6.7400	3.7000	83.2	6.2	18.9	13207.0	5.02
13075	45538.1112518	254	250	2.4200	4.3950	1.9050	83.5	7.2	47.8	18039.0	5.10
13075	45571.6806030	287	248	1.0500	1.4700	0.6450	83.9	3.3	61.6	31627.0	4.68
13075	45447.5814896	252	239	0.7800	1.4400	0.6600	90.6	0.5	46.8	30667.0	4.57
13075	45397.6077766	204	-1	0.3500	1.1000	0.0000	88.0	2.0	64.3	34093.0	3.18
13075	45397.6078072	289	176	0.5400	0.7450	0.5300	88.0	2.0	64.3	34100.0	4.53
13075	45397.6078072	253	188	0.5400	0.9950	0.6350	88.0	2.0	64.3	34097.0	4.59
13075	45593.0093689	313	181	1.1300	1.3750	0.9400	68.9	3.2	62.6	33039.0	4.72
13075	45607.8221741	267	225	0.6450	1.0450	0.5150	72.7	1.5	61.9	39353.0	4.61
13080	45474.8244934	309	334	7.3050	9.0150	2.9850	80.8	5.9	-10.8	16738.0	5.76
13080	45403.6809158	431	301	1.0650	0.7800	0.2800	90.2	3.6	60.4	22952.0	6.65
13080	45522.3086853	1048	-1	0.7700	0.2650	0.0000	91.2	3.6	62.8	20211.0	3.45
13080	45613.1337585	255	295	0.7350	1.3200	0.1700	99.9	3.7	45.8	35418.0	4.46
13089	45477.2967834	296	305	1.9000	2.4900	0.8850	94.0	2.2	-0.7	34792.0	4.77
13089	45513.0144043	257	278	1.0750	1.9100	0.7400	87.2	2.5	-0.7	34893.0	4.67
13089	45614.6090698	238	358	1.1400	2.3900	0.7500	77.0	2.4	-0.3	34808.0	4.59

13090	45474.8244476	252	270	2.2550	4.1600	1.6600	80.8	6.0	-10.9	16342.0	5.85
13090	45436.1108093	388	-1	0.9150	0.7800	0.0000	89.9	1.2	54.0	29659.0	14.02
13090	45435.6096115	267	214	0.5800	0.9400	0.4950	88.3	1.8	55.5	28406.0	5.02
13090	45595.0968323	316	277	2.3200	2.7900	1.0850	111.7	6.9	61.1	23749.0	4.66
13090	45635.3279419	279	243	4.1250	6.1200	2.7500	93.7	0.8	-13.0	15291.0	4.70
13091	45527.5797272	279	155	0.6800	1.0050	0.9100	85.8	0.8	-9.3	36763.0	9.08
13092	45573.0309143	219	-1	0.1950	0.5000	0.0000	60.0	4.7	-0.5	34551.0	4.05
13098	45419.3793945	327	245	1.2600	1.4500	0.6450	84.9	5.3	12.7	16936.0	5.15
13112	45478.5018463	883	-1	0.9050	0.3400	0.0000	92.9	1.2	62.0	38428.0	3.92
13112	45478.5018921	390	-1	0.7700	0.6500	0.0000	92.9	1.2	62.0	38430.0	5.61
13112	45506.0611267	306	-1	0.5100	0.6350	0.0000	95.1	1.6	54.5	38850.0	4.26
13112	45506.0611420	415	167	0.8000	0.6100	0.4800	95.1	1.6	54.5	38849.0	8.91
13112	45527.5369568	489	-1	0.5700	0.3500	0.0000	85.1	3.8	36.9	26489.0	3.72
13112	45527.5369873	298	261	1.5300	1.9800	0.8200	85.1	3.8	36.9	26483.0	4.67
13112	45633.5860596	276	333	0.9550	1.4450	0.4800	88.5	3.3	63.9	35025.0	4.43
13112	45637.6632996	289	150	1.0350	1.4300	1.3800	86.8	2.9	64.1	35778.0	4.48
13112	45637.6632996	571	-1	1.0750	0.5600	0.0000	86.8	2.9	64.1	35780.0	11.64
13124	45418.2330704	300	286	1.3250	1.6850	0.6350	86.5	1.4	36.3	38571.0	4.47
13124	45403.1921081	312	220	2.0950	2.5550	1.3000	81.7	2.8	48.2	33667.0	4.45
13137	45493.6482239	312	263	3.4650	4.2250	1.7350	79.8	4.9	-26.8	10379.0	6.82
13137	45579.9059448	512	335	7.0700	4.1000	1.3550	60.5	13.0	28.5	8475.0	7.36
13169	45393.4536171	340	225	2.4250	2.6500	1.3100	92.7	5.1	60.4	22128.0	4.74
13169	45393.4536972	207	2749	0.5500	1.6600	0.2900	92.7	5.1	60.4	22134.0	16.45
13169	45587.9285278	550	244	0.9500	0.5150	0.2300	65.4	6.5	62.1	19624.0	12.46
13169	45608.8143921	239	224	0.9700	2.0250	1.0050	73.3	3.0	10.1	28317.0	5.02
13177	45475.5071564	284	226	1.4900	2.1350	1.0500	95.8	2.5	-0.8	35062.0	4.79
13177	45476.5092926	264	237	1.3350	2.2300	1.0300	94.9	2.4	-0.7	35044.0	4.66
13177	45488.5346832	268	250	1.1900	1.9150	0.8300	85.1	2.3	-0.4	35032.0	4.67
13177	45552.5245666	290	209	1.1200	1.5350	0.8350	94.1	0.8	0.6	34940.0	4.64
13177	45553.5272522	266	232	1.1650	1.9100	0.9050	93.0	0.1	0.8	34928.0	4.70
13205	45537.7549438	272	665	28.3300	44.3500	10.0100	82.7	12.9	51.9	7726.0	6.88
13205	45407.2013245	290	264	4.6800	6.4250	2.6300	92.4	3.7	63.4	17664.0	5.16
13205	45507.2963104	298	255	23.2950	30.0400	12.7550	93.1	7.3	-32.6	7870.0	5.71
13205	45424.1672134	368	751	1.7950	1.7100	0.3700	95.6	3.8	60.5	23061.0	20.47
13205	45432.1905060	507	-1	0.5900	0.3450	0.0000	86.7	2.3	52.2	31365.0	4.58
13205	45432.1905365	498	161	2.3100	1.3750	1.1600	86.7	2.3	52.2	31375.0	4.56
13205	45459.2513733	283	219	0.7600	1.0950	0.5600	93.1	1.6	31.1	38315.0	4.43
13205	45492.3336639	296	240	11.5700	15.1400	6.9000	88.2	2.4	-18.6	12150.0	.5.18
13205	45614.6187134	727	-1	0.6950	0.3000	0.0000	77.2	0.7	52.2	30760.0	10.51
13215	45427.0320358	249	216	1.1350	2.1550	1.1200	92.5	2.0	59.6	25985.0	4.73
13215	45460.9707260	278	255	0.6650	0.9900	0.4200	92.5	1.0	27.7	36417.0	4.42
13237	45380.0534210	281	249	0.9750	1.4250	0.6200	99.5	4.8	53.5	38508.0	4.55
13237	45384.0622292	276	252	1.0450	1.5800	0.6800	102.2	5.2	50.9	37285.0	4.55
13237	45385.9963760	276	162	0.3800	0.5750	0.4800	90.1	3.1	57.3	39103.0	4.59
13237	45417.9955215	296	396	0.9050	1.1900	0.3450	92.0	2.6	45.0	32625.0	4.91

13237	45509.5686188	314	267	0.7750	0.9400	0.3800	90.4	2.5	60.7	38503.0	4.52
13237	45588.0132141	266	301	1.6600	2.7300	0.9800	98.8	4.6	36.0	25790.0	4.58
13237	45598.4644470	534	113	1.3250	0.7400	1.4000	109.5	5.1	40.3	28853.0	4.64
13253	45379.6240196	266	197	0.5800	0.9550	0.5700	98.5	4.6	53.5	39584.0	4.56
13253	45379.6239777	430	-1	0.6550	0.4800	0.0000	98.5	4.6	53.5	39589.0	6.57
13253	45509.2103119	442	-1	0.7600	0.5400	0.0000	91.1	2.2	61.2	38801.0	4.41
13253	45509.2103119	293	268	0.5200	0.6950	0.2800	91.1	2.2	61.2	38799.0	4.62
13253	45525.0286407	282	204	0.3900	0.5650	0.3200	88.3	2.3	57.1	39653.0	4.47
13253	45594.2399292	260	227	0.7050	1.2100	0.5900	112.5	4.5	51.5	37990.0	4.40
13253	45599.3946228	262	247	1.1300	1.9200	0.8450	109.2	4.9	40.7	30076.0	4.49
13269	45404.5996628	353	406	2.0650	2.1200	0.6050	92.3	1.3	0.0	34925.0	4.58
13269	45484.5602264	4460	185	2.4400	0.5950	0.3900	82.1	4.3	-0.5	35506.0	3.39
13269	45499.5939636	277	239	1.6100	2.4200	1.1100	91.7	1.9	-0.1	34997.0	4.66
13269	45522.5698090	230	-1	0.4800	1.1000	0.0000	79.9	3.1	-0.1	35168.0	4.86
13269	45523.5720215	266	220	1.6550	2.7250	1.3850	81.1	2.8	-0.2	35124.0	4.64
13269	45523.5720520	282	-1	0.6650	0.9600	0.0000	81.1	2.8	-0.2	35119.0	23.48
13294	45476.4401092	348	248	0.8450	0.8900	0.3900	95.0	3.7	-12.0	23906.0	4.84
13295	45512.0614929	279	225	1.5350	2.2800	1.1250	91.4	3.4	58.3	25096.0	5.16
13295	45512.0614929	794	161	1.0800	0.4300	0.3600	91.4	3.4	58.3	25094.0	5.26
13295	45512.5636597	287	285	2.5400	3.5550	1.3450	91.6	2.4	57.8	25674.0	5.11
13295	45535.6045227	296	216	1.6650	2.1800	1.1350	79.6	4.4	41.2	37935.0	4.59
13295	45535.1034088	261	216	0.7050	1.2050	0.6300	80.1	4.5	41.6	37803.0	4.62
13295	45528.6628876	298	288	1.3300	1.7100	0.6400	87.1	1.5	32.8	38403.0	4.63
13295	45527.5909576	299	233	1.1300	1.4500	0.6850	85.9	2.7	45.5	35095.0	4.74
13298	45528.6622772	328	222	0.6050	0.6950	0.3500	87.1	1.5	32.8	37777.0	4.67
13298	45527.5907440	286	263	0.5550	0.7800	0.3200	85.9	2.7	45.5	35575.0	4.72
13383	45513.5778809	306	226	0.9950	1.2400	0.6100	85.8	3.3	45.2	32437.0	4.54
13383	45514.0790100	283	227	1.1750	1.6950	0.8250	85.6	3.4	44.6	32083.0	4.61
13383	45514.0789642	267	260	1.0350	1.6850	0.7000	85.6	3.4	44.6	32092.0	4.56
13383	45435.5493164	280	231	1.9400	2.8450	1.3600	82.7	3.2	60.4	24534.0	5.12
13383	45436.0501633	299	316	2.0150	2.5850	0.8950	82.6	3.4	60.7	25015.0	5.09
13383	45647.0369873	253	244	0.7100	1.3000	0.5800	93.2	3.9	59.8	39542.0	4.49
13390	45512.4327393	244	-1	0.6050	1.2000	0.0000	87.1	3.1	45.6	32367.0	4.65
13390	45538.2030334	261	263	1.4900	2.5500	1.0450	95.1	1.9	33.7	23723.0	4.71
13390	45506.5627441	252	204	0.5450	1.0100	0.5700	93.6	1.7	52.5	36441.0	4.54
13390	45488.0940247	310	168	0.5050	0.6200	0.4800	86.4	2.5	55.8	37896.0	4.55
13390	45648.6825256	610	279	1.1700	0.5700	0.2200	94.2	4.2	58.2	38668.0	4.14
13431	45515.5536041	377	175	1.5000	1.3600	0.9800	94.7	4.1	-0.3	35420.0	22.35
13431	45468.5337219	287	287	2.0550	2.8800	1.0800	88.7	4.2	-0.1	35524.0	4.59
13431	45398.0490570	265	230	1.6200	2.6750	1.2850	87.9	1.1	0.1	34919.0	4.53
13431	45494.0462036	290	277	1.8900	2.5950	1.0100	86.3	2.3	0.1	35063.0	4.66
13431	45495.0480194	278	243	1.8300	2.7250	1.2250	85.6	2.6	0.1	35110.0	4.63
13431	45518.0248108	269	281	1.7600	2.8100	1.0750	96.9	2.5	2.6	35120.0	4.64
13432	45549.9914398	282	217	1.6450	2.3800	1.2300	89.6	2.0	38.8	24530.0	5.19
13446	45511.6341400	237	391	0.5750	1.2300	0.3600	90.2	2.4	62.3	34298.0	4.69

13446	45641.9678345	279	-1	0.7150	1.0600	0.0000	83.6	2.9	62.3	34142.0	4.58
13446	45641.9678345	264	706	0.6250	1.0400	0.2300	83.6	2.9	62.3	34142.0	3.20
13446	45527.9531708	246	197	0.4500	0.8800	0.5250	87.0	2.9	62.9	36842.0	4.67
13446	45393.3180847	269	262	3.9850	6.3650	2.6200	92.6	6.5	19.6	13746.0	4.66
13446	45574.0381470	299	282	2.8550	3.6700	1.4000	60.7	7.6	28.1	18918.0	5.87
13447	45630.3173218	345	388	0.8900	0.9500	0.2800	96.7	1.7	-4.7	23368.0	4.84
13447	45633.1791992	311	429	0.8850	1.0850	0.3000	94.7	1.6	-2.0	22459.0	4.94
13554	45509.9745331	366	193	1.7150	1.6550	1.0150	88.9	0.1	-0.4	34888.0	4.67
13554	45510.9769440	249	222	1.1900	2.2550	1.1350	90.2	0.4	-0.8	34891.0	4.68
13554	45535.9539795	275	219	2.0000	3.0650	1.5650	80.2	3.1	-0.5	35199.0	4.64
13554	45377.5021744	243	366	0.8050	1.6200	0.5000	80.7	2.6	-0.2	35066.0	4.47
13554	45422.4595184	370	161	1.0900	1.0300	0.8650	97.0	3.7	-0.0	35285.0	4.57
13554	45423.4620590	295	218	1.1600	1.5300	0.7900	95.8	3.3	3.6	35208.0	4.56
13554	45435.4889603	235	220	0.5850	1.2700	0.6450	82.6	3.5	-0.0	35234.0	4.58
13583	45557.5610352	476	267	0.8100	0.5200	0.2100	83.0	2.2	-44.2	21406.0	4.34
13585	45471.2024841	323	263	1.5200	1.7800	0.7300	94.8	1.5	49.2	34225.0	4.53
13591	45446.5760879	259	272	1.3650	2.3750	0.9400	91.7	0.2	60.2	24154.0	4.87
13591	45446.5760879	465	170	1.0550	0.7000	0.5300	91.7	0.2	60.2	24150.0	6.82
13591	45471.2024841	323	263	1.5200	1.7800	0.7300	94.8	1.5	49.2	34225.0	4.53
13591	45471.2025146	275	234	0.7700	1.1800	0.5550	94.8	1.5	49.2	34146.0	4.56
13591	45535.3518829	254	236	7.1600	12.9900	6.0500	98.7	7.8	-24.6	9762.0	5.32
13591	45458.3875961	234	-1	0.4300	0.9500	0.0000	93.6	1.6	56.2	28426.0	8.45
13591	45487.0248260	392	190	0.9550	0.7950	0.5000	92.9	1.8	34.3	38089.0	4.43
13591	45487.0247955	449	-1	1.2000	0.8350	0.0000	92.9	1.8	34.3	38094.0	23.54
13591	45495.4745026	285	196	0.9000	1.2750	0.7650	84.4	2.9	17.0	30633.0	4.53
13591	45652.6112060	299	246	1.0100	1.2900	0.5700	95.9	2.9	23.9	34278.0	4.59
13595	45498.5561523	271	228	1.4550	2.2950	1.1150	96.2	2.5	-0.7	35083.0	4.68
13595	45499.5583191	269	215	1.2900	2.0550	1.0750	95.0	2.3	2.2	35058.0	4.64
13595	45537.5655060	291	-1	0.9750	1.3250	0.0000	95.7	1.8	-0.7	35016.0	4.85
13595	45538.5679626	254	222	0.9800	1.7800	0.8950	94.8	1.2	-0.6	34965.0	4.68
13595	45564.0817871	238	196	0.7600	1.6000	0.9600	90.4	2.4	0.3	35069.0	4.60
13603	45512.7781677	324	304	7.3100	8.5400	3.0400	91.7	5.4	64.0	18457.0	5.61
13603	45512.7781677	170	295	0.8900	4.7500	0.2200	91.7	5.4	64.0	18456.0	16.03
13603	45581.5586548	301	262	3.6050	4.5700	1.8800	61.2	7.2	51.6	18705.0	5.94
13603	45402.8140259	258	215	2.5950	4.5400	2.3850	90.5	2.5	19.1	18218.0	4.65
13603	45549.0334015	392	-1	0.9400	0.7850	0.0000	97.7	4.3	-63.9	18347.0	3.86
13603	45560.3287506	328	453	4.8400	5.5550	1.4900	85.2	4.9	-23.0	18388.0	5.91
13603	45590.0618286	247	380	2.3400	4.5100	1.3500	66.2	6.4	-6.0	18591.0	5.92
13606	45407.2170868	270	248	2.5600	4.0650	1.7800	92.9	2.1	-21.5	18314.0	4.55
13606	45493.6332703	265	179	1.1050	1.8300	1.2700	86.7	3.1	-62.5	18382.0	5.44
13606	45582.1319427	2098	-1	1.1450	0.3100	0.0000	61.6	7.4	57.0	18778.0	20.08
13607	45571.8857727	289	325	4.3050	5.9450	2.0100	83.3	3.1	10.4	18268.0	5.97
13607	45375.4199066	368	179	2.6900	2.5700	1.7750	81.0	1.9	30.6	18206.0	4.34
13607	45375.4199791	892	139	1.3650	0.5100	0.5800	81.0	1.9	30.6	18208.0	3.87
13607	45582.1283264	302	225	2.9900	3.7850	1.8650	60.7	7.3	41.9	18725.0	5.92

13607	45582.5623321	256	266	3.6200	6.4750	2.6300	61.7	7.5	60.1	18764.0	5.93
13607	45585.9144134	289	276	3.3800	4.6600	1.8200	63.0	6.8	12.2	18655.0	5.89
13607	45629.9839172	277	198	2.8350	4.2600	2.5200	88.0	6.3	-56.6	18578.0	5.50
13607	45591.1897583	317	-1	0.5500	0.6600	0.0000	114.2	7.0	-64.6	18686.0	5.20
13607	45582.3135834	162	126	13.8350	85.9300	123.9100	115.8	7.7	-64.0	18761.0	4.05
13608	45462.4110413	262	269	4.7600	8.0950	3.2400	89.2	1.1	-10.0	3762.0	15.53
13609	45483.8394470	392	264	1.2750	1.0650	0.4350	91.3	3.4	-42.5	14018.0	6.33
13609	45550.8342285	264	-1	0.3550	0.5900	0.0000	90.7	4.5	-36.1	17220.0	5.19
13609	45493.0002136	284	187	0.9350	1.3350	0.8600	79.5	3.7	-44.4	14023.0	6.11
13609	45530.8653259	292	170	0.3700	0.5000	0.3800	90.4	3.6	-47.0	18236.0	5.24
13610	45385.8387184	309	225	11.6750	14.4200	7.1350	90.3	0.9	-20.1	18162.0	4.44
13610	45568.0608673	269	262	8.8650	14.1450	5.8400	99.1	4.1	-31.0	18322.0	5.94
13610	45553.5379639	276	245	8.8950	13.4500	5.9900	92.7	2.5	-54.0	18217.0	5.96
13610	45597.1080627	315	229	11.0000	13.2650	6.4050	111.7	6.7	21.4	18624.0	5.83
13610	45606.4797363	287	222	11.2600	15.7750	7.9400	104.1	6.3	38.8	18568.0	5.75
13624	45542.5052032	259	259	0.9500	1.6450	0.6850	90.1	0.6	-0.1	34888.0	4.67
13624	45543.5060883	289	172	0.4200	0.5800	0.4300	89.2	1.5	-0.2	34944.0	7.04
13624	45566.4797974	282	455	1.3650	1.9800	0.5300	100.6	2.4	0.1	35057.0	4.57
13624	45567.4818268	224	254	0.8650	2.1100	0.9000	99.7	2.3	-0.0	35032.0	4.62
13624	45394.0034752	283	284	1.6700	2.4000	0.9100	89.5	1.2	-0.4	34895.0	4.51
13624	45617.9725037	309	254	2.0850	2.5750	1.1000	79.5	2.0	0.2	35004.0	4.51
13624	45618.9743347	475	174	2.6150	1.6800	1.2300	80.3	1.9	0.1	34988.0	4.53
13624	45582.4415283	294	230	2.4800	3.2950	1.5850	116.8	4.1	-0.0	35417.0	4.60
13624	45583.4433136	352	258	3.1200	3.2300	1.3550	116.0	4.0	0.1	35387.0	4.61
13624	45584.4452362	303	290	2.6300	3.3150	1.2300	115.4	4.0	1.4	35359.0	4.58
13624	45585.4470062	280	262	2.1400	3.1400	1.2950	114.6	3.8	1.5	35332.0	4.62
13629	45464.6403046	263	234	0.5550	0.9350	0.4400	86.9	4.0	-45.6	25282.0	5.56
13629	45464.6402740	389	151	0.5900	0.5000	0.4800	86.9	4.0	-45.6	25281.0	3.75
13629	45464.6402893	913	-1	0.8000	0.2950	0.0000	86.9	4.0	-45.6	25281.0	4.74
13630	45535.2749481	256	229	1.5250	2.7300	1.3200	98.5	2.1	0.1	34969.0	4.65
13630	45536.2770081	259	238	1.5550	2.7050	1.2450	97.6	2.0	-0.1	34948.0	4.60
13630	45537.2790070	258	227	1.3350	2.3350	1.1400	96.6	2.0	-0.1	34939.0	4.68
13630	45460.7955093	298	213	2.5450	3.2750	1.7350	80.0	3.8	-0.1	35327.0	4.61
13630	45461.7977982	289	251	2.4250	3.3550	1.4500	81.2	3.6	-0.0	35279.0	4.62
13630	45462.8000793	255	246	2.1100	3.7950	1.6750	82.3	3.4	0.0	35239.0	4.67
13630	45463.8021698	264	305	2.2400	3.7400	1.3300	83.4	3.4	0.0	35238.0	4.59
13630	45464.8048401	266	298	2.2750	3.7200	1.3450	84.7	2.8	-0.1	35127.0	4.61
13630	45464.8048401	271	279	2.2550	3.5400	1.3650	84.7	2.8	-0.1	35121.0	4.61
13630	45465.8075867	304	450	2.1900	2.7500	0.7400	85.9	2.1	-0.1	35018.0	4.62
13630	45466.8102875	290	205	2.3000	3.1500	1.7650	87.2	1.6	0.0	34951.0	4.66
13630	45467.8128967	266	237	2.1350	3.5000	1.6150	88.4	1.0	-0.1	34907.0	4.66
13630	45468.8154755	252	278	2.0700	3.8350	1.4850	89.3	0.5	-2.0	34886.0	4.67
13630	45469.8179779	273	248	2.0800	3.2350	1.4200	90.7	0.1	0.1	34879.0	4.67
13630	45470.8192139	264	238	2.1300	3.5600	1.6400	91.6	1.0	0.1	34903.0	4.66
13630	45494.7989349	271	281	2.6050	4.0950	1.5700	86.8	1.4	0.0	34944.0	4.62

13630	45497.8087006	304	212	2.7750	3.4850	1.8650	90.2	2.4	0.1	35075.0	4.65
13630	45488.3200226	280	224	2.9000	4.2650	2.1200	85.6	2.1	-0.0	34989.0	4.67
13631	45514.1595612	319	164	1.0050	1.1950	0.9700	85.4	2.5	0.2	35091.0	4.67
13631	45515.1614990	260	205	1.2350	2.1350	1.1950	84.7	2.6	0.3	35117.0	4.66
13631	45537.1359405	293	227	1.9250	2.5850	1.2650	96.7	1.8	0.3	35002.0	4.65
13631	45564.6542053	318	228	1.9050	2.2750	1.1050	90.6	2.4	-0.2	35073.0	4.63
13637	45461.5829620	283	272	1.1750	1.6900	0.6700	80.8	3.7	-0.2	35340.0	4.62
13637	45638.1163940	192	272	0.2800	1.0350	0.4100	91.9	0.9	-0.0	34928.0	4.28
13637	45639.1182251	336	-1	0.8900	0.9900	0.0000	91.2	0.9	-0.0	34917.0	4.43
13637	45641.1218262	245	356	0.7000	1.3800	0.4350	89.7	0.8	-0.1	34912.0	4.48
13643	45634.7181702	299	281	0.6000	0.7700	0.2950	88.6	1.7	-1.0	35075.0	4.55
13643	45639.2611694	352	270	1.5750	1.6300	0.6500	90.9	0.9	1.0	35297.0	4.44
13644	45571.0875397	1909	95	0.8950	0.2500	0.8000	83.9	2.7	-46.5	13532.0	6.35
13644	45571.0875702	705	-1	1.0400	0.4600	0.0000	83.9	2.7	-46.5	13535.0	13.10
13651	45441.0024490	295	236	2.0250	2.6750	1.2450	92.1	2.3	0.1	35045.0	4.63
13651	45511.0122986	587	-1	1.6850	0.8500	0.0000	89.5	0.4	0.1	34898.0	6.89
13652	45390.1022110	291	328	1.8950	2.5750	0.8650	81.0	2.2	0.1	35046.0	4.39
13652	45514.0879974	284	234	1.7800	2.5400	1.1950	85.6	2.5	0.3	35087.0	4.65
13652	45537.0642548	269	281	1.6600	2.6500	1.0150	96.9	1.9	0.2	35010.0	4.64
13652	45395.5814438	293	598	2.0400	2.7400	0.6400	91.1	2.1	-0.0	35001.0	4.50
13652	45390.5687981	283	252	2.0750	2.9800	1.2800	85.1	0.9	-0.0	34892.0	4.49
13652	45564.5826263	285	-1	1.7750	2.5100	0.0000	90.3	2.5	-0.1	35076.0	4.63
13658	45416.6955185	1273	-1	1.8500	0.6100	0.0000	91.3	0.3	-22.8	35783.0	4.80
13658	45468.8125458	287	219	0.5100	0.7150	0.3650	89.5	0.4	-15.2	25337.0	4.80
13658	45527.2302246	379	135	0.7000	0.6300	0.7700	85.8	11.8	13.8	8765.0	4.30
13658	45624.0922852	10000	-1	2.3350	0.2750	0.0000	99.4	2.6	-8.1	15659.0	5.38
13666	45469.6007233	274	641	0.8700	1.3350	0.3050	90.2	0.4	-12.4	20539.0	5.12
13669	45437.6371384	365	173	1.6750	1.6250	1.1950	95.2	3.1	0.2	35307.0	4.61
13669	45438.6393356	281	290	1.5750	2.2900	0.8500	94.2	3.1	0.3	35277.0	4.60
13669	45438.6393280	361	250	3.8150	3.7800	1.6400	94.2	3.1	0.3	35272.0	4.61
13669	45507.6472168	278	257	1.3400	1.9950	0.8400	92.7	1.5	-0.5	34983.0	4.66
13669	45626.9891052	289	260	2.3500	3.2500	1.3500	83.9	1.4	0.2	34649.0	4.47
13676	45584.0456696	10000	187	1.9100	0.2950	0.1900	63.1	7.6	-32.0	18533.0	3.89
13753	45480.2328339	297	253	3.8200	4.9600	2.1250	90.7	0.1	2.4	34544.0	4.68
13753	45500.5297546	272	251	2.6650	4.1500	1.7950	92.7	4.3	-2.7	35101.0	4.65
13753	45578.6141510	287	-1	0.4000	0.5600	0.0000	59.7	4.9	-2.2	35291.0	4.58
13753	45640.0130005	267	224	0.7000	1.1350	0.5650	87.9	0.8	1.9	34604.0	4.40
13782	45477.3681335	346	201	0.8900	0.9450	0.5450	94.0	2.3	0.1	35047.0	4.61
13782	45439.8915939	284	200	0.7750	1.1050	0.6450	95.1	3.5	-0.1	35284.0	4.55
13782	45572.8161011	284	254	0.9200	1.3150	0.5600	59.2	4.7	-0.1	35611.0	4.62
13782	45573.8182068	302	224	0.9900	1.2500	0.6200	60.1	4.5	-0.1	35568.0	4.63
13782	45649.8874512	339	3545	1.3800	1.5150	0.2600	94.0	0.9	-0.0	34904.0	4.05
13782	45650.8892517	292	259	0.9650	1.3050	0.5450	94.7	1.0	0.0	34908.0	4.42
13782	45653.8945312	338	181	0.9700	1.0700	0.7300	96.9	1.3	-0.0	34925.0	4.42
13782	45654.8963013	318	270	1.0400	1.2400	0.4950	97.6	1.4	0.0	34933.0	4.46

13782	45651.8910217	312	204	0.9250	1.1300	0.6400	95.5	1.1	-0.0	34914.0	4.40
13782	45612.3550110	299	212	0.8100	1.0350	0.5550	101.4	2.1	0.1	35013.0	4.49
13875	45407.4141235	293	189	0.6000	0.8050	0.5100	92.2	2.7	62.8	37257.0	4.47
13875	45407.4141235	270	-1	0.4850	0.7700	0.0000	92.2	2.7	62.8	37258.0	4.59
13875	45407.4141235	222	166	0.3100	0.7700	0.6100	92.2	2.7	62.8	37257.0	4.58
13875	45419.0129776	355	356	1.0100	1.0300	0.3250	86.3	1.4	60.5	39044.0	4.31
13875	45419.0129471	311	-1	0.4000	0.4900	0.0000	86.3	1.4	60.5	39047.0	6.25
13875	45597.8754883	392	302	1.3950	1.1600	0.4150	71.9	2.1	62.9	36666.0	4.69
13875	45616.9800110	293	314	1.4450	1.9300	0.6700	79.0	0.5	50.9	33350.0	4.70
13878	45534.9518280	274	245	2.0000	3.0750	1.3650	79.3	3.3	-1.0	35218.0	4.62
13882	45410.9963989	275	187	0.5150	0.7850	0.5050	88.2	1.3	62.6	39010.0	4.45
13882	45410.9964294	2205	-1	0.9300	0.2500	0.0000	88.2	1.3	62.6	39012.0	7.40
13882	45435.5511169	279	626	0.9350	1.3900	0.3200	82.5	2.8	50.3	32847.0	4.65
13882	45454.3801956	242	385	0.8000	1.6200	0.4800	98.2	2.6	46.7	29816.0	4.52
13882	45603.6716919	415	-1	0.4200	0.3200	0.0000	75.3	1.2	61.8	39446.0	4.06
13882	45603.6717529	468	151	0.5400	0.3550	0.3400	75.3	1.2	61.8	39443.0	3.47
13890	45469.5545044	422	111	1.2700	0.9500	1.8900	96.6	1.3	57.0	37015.0	16.03
13890	45469.5545196	557	-1	1.1400	0.6100	0.0000	96.6	1.3	57.0	37012.0	6.72
13890	45469.5545654	774	-1	0.9800	0.4000	0.0000	96.6	1.3	57.0	37005.0	4.44
13890	45469.5545807	297	-1	0.3500	0.4550	0.0000	96.6	1.3	57.0	37000.0	4.67
13890	45469.5545959	290	-1	0.4050	0.5550	0.0000	96.6	1.3	57.0	37000.0	9.71
13890	45469.5545196	462	-1	1.0300	0.6900	0.0000	96.6	1.3	57.0	37014.0	9.36
13890	45470.0556946	270	360	0.9150	1.4550	0.4550	96.2	1.3	56.4	36811.0	4.52
13890	45477.5731964	292	190	0.7100	0.9600	0.6050	93.8	1.4	51.2	32807.0	4.57
13890	45478.0743866	266	268	0.8500	1.3900	0.5600	93.5	1.4	50.7	32463.0	4.57
13890	45551.9919128	316	210	18.8700	22.6900	12.3200	76.5	12.4	26.0	8865.0	5.76
13890	45429.5387268	292	325	0.7550	1.0200	0.3450	89.2	1.1	62.7	35401.0	4.64
13890	45430.0398331	326	182	0.7600	0.8800	0.5950	89.1	1.0	62.7	35633.0	4.65
13890	45522.5353546	317	430	20.4750	24.4900	6.7700	91.1	1.7	5.6	7845.0	5.76
13890	45633.0105286	292	299	0.8000	1.0800	0.3900	88.5	2.6	55.6	36821.0	4.50
13897	45571.6780243	258	259	2.5300	4.4400	1.8550	83.5	4.6	48.0	18505.0	4.99
13897	45424.1672134	368	751	1.7950	1.7100	0.3700	95.6	3.8	60.5	23061.0	20.47
13897	45424.1672211	262	197	0.7250	1.2300	0.7300	95.6	3.1	59.9	30616.0	4.75
13897	45427.2462387	256	184	0.5700	1.0150	0.6700	92.1	1.5	61.7	33919.0	4.63
13897	45427.2462463	402	-1	0.6750	0.5300	0.0000	92.1	1.5	61.7	33920.0	3.70
13897	45427.2462387	344	-1	0.5700	0.6100	0.0000	92.1	1.5	61.7	33920.0	4.76
13897	45430.3262024	254	234	0.5650	1.0300	0.4850	89.0	1.1	62.8	36554.0	4.59
13897	45465.6171417	255	264	0.5750	1.0400	0.4250	85.4	2.6	53.0	34902.0	4.52
13897	45608.8955078	252	450	0.8450	1.5600	0.4200	73.8	1.5	61.4	32096.0	4.80
13899	45567.0514679	310	211	2.2300	2.7400	1.4800	100.5	3.0	0.8	35527.0	4.60
13899	45468.9587402	312	242	3.2750	4.0000	1.8050	89.8	0.3	-0.1	35340.0	4.67
13899	45485.2117310	297	272	3.6900	4.7900	1.9000	83.0	3.6	-0.3	35767.0	4.60
13899	45529.4762268	339	219	2.1500	2.3600	1.2050	83.5	2.9	0.8	35536.0	4.66
13899	45461.3347168	292	270	2.8350	3.8200	1.5250	90.6	0.7	-0.1	35388.0	4.71
13899	45582.7634735	296	258	2.9800	3.9200	1.6400	61.0	4.4	-0.9	36118.0	4.61

13900	45425.3953781	320	274	4.1500	4.9150	1.9300	93.5	2.7	2.5	34929.0	4.58
13900	45425.3953781	257	295	2.7800	4.9300	0.3650	93.5	2.7	2.5	34927.0	4.62
13900	45527.3289795	275	270	1.6850	2.5800	1.0300	86.0	2.5	2.8	34831.0	4.66
13900	45547.0834198	259	-1	1.4250	2.4700	0.0000	100.7	2.7	2.5	34835.0	4.63
13900	45554.0279846	295	268	1.5200	2.0100	0.8100	93.0	0.1	2.2	34620.0	4.67
13901	45433.4034958	455	-1	0.9200	0.6300	0.0000	85.0	0.7	51.9	106856.0	4.50
13901	45637.9464722	539	194	0.6500	0.3600	0.2200	86.9	0.6	47.9	153024.0	13.45
13901	45638.5905151	2781	117	1.3900	0.2850	0.5000	87.1	0.5	47.7	175157.0	3.89
13905	45419.3823090	249	206	0.4050	0.7700	0.4300	85.1	5.3	-3.6	19801.0	4.87
13905	45447.3069763	273	-1	0.6050	0.9350	0.0000	91.0	1.9	-17.3	18226.0	5.15
13907	45434.9537353	489	-1	0.6600	0.4050	0.0000	89.5	1.0	-5.6	22030.0	3.74
13907	45484.1974182	312	-1	0.4350	0.5300	0.0000	82.2	5.2	-24.4	27293.0	4.80
13908	45441.2841110	285	223	0.4100	0.5800	0.2900	91.4	1.7	28.4	25413.0	4.89
13909	45567.3406982	579	-1	0.5750	0.2950	0.0000	100.1	4.1	-9.5	18439.0	3.82
13909	45585.4473572	338	293	0.3950	0.4350	0.1600	114.6	5.9	1.3	20585.0	5.38
13912	45423.3185425	329	227	0.9950	1.1400	0.5550	96.3	4.3	2.7	25707.0	4.95
13912	45601.5898132	568	127	12.5600	6.5800	9.2100	73.5	6.8	26.7	5315.0	8.91
13913	45568.1941071	271	307	1.2850	2.0250	0.7150	98.9	3.8	20.3	12566.0	5.79
13913	45576.0689545	262	431	1.3900	2.3550	0.6500	119.1	10.0	19.5	12891.0	5.63
13913	45594.4636230	310	781	1.4700	1.8050	0.3850	113.4	8.1	2.4	12855.0	5.49
13914	45538.6740265	280	472	3.1400	4.6000	1.2050	83.1	6.3	-3.8	10160.0	7.12
13914	45544.1137085	269	298	2.0700	3.3200	1.2000	90.3	3.9	-14.0	10045.0	7.20
13915	45494.4092560	347	223	9.5350	10.0750	5.0400	85.7	9.4	-19.5	4247.0	10.19
13915	45598.1088257	294	340	5.8150	7.7300	2.5250	110.8	12.7	26.7	6752.0	7.63
13939	45463.4075165	450	228	1.8200	1.2650	0.6150	87.8	1.4	16.8	13542.0	6.20
13940	45566.6184998	252	319	1.1700	2.1700	0.7450	100.1	5.1	22.5	14038.0	5.91
13940	45642.4104614	343	246	0.6500	0.7000	0.3100	88.8	1.1	-3.3	24408.0	4.50
13954	45440.2863769	285	265	2.7200	3.8650	1.5750	92.5	2.4	0.2	35930.0	4.56
13954	45543.0777130	259	196	1.2450	2.1700	1.3050	90.2	0.6	-0.7	35806.0	4.65
13954	45543.0777435	1519	-1	1.3350	0.4150	0.0000	90.2	0.6	-0.7	35805.0	8.65
13958	45632.6429748	351	218	0.7950	0.8250	0.4250	87.7	1.2	4.0	19333.0	5.20
13960	45577.9114227	416	-1	1.0650	0.8100	0.0000	59.8	7.9	57.7	19002.0	5.29
13960	45581.9184875	1587	246	2.4400	0.7450	0.3300	61.3	7.2	59.6	20170.0	26.57
13961	45496.6747894	338	57	0.3400	0.3750	10.5700	88.5	3.5	50.9	33820.0	4.19
13964	45538.8308411	269	271	0.7000	1.1200	0.4450	84.1	4.0	62.6	38614.0	4.59
13964	45572.9631958	319	253	14.9100	17.7100	7.5950	59.5	9.5	21.6	14573.0	6.32
13964	45577.8388367	740	80	0.8000	0.3400	2.0200	59.7	4.8	52.2	34769.0	3.19
13964	45596.5957642	282	293	1.7900	2.5850	0.9500	72.1	2.3	62.7	34864.0	4.69
13967	45590.9396362	275	136	0.6650	1.0150	1.2200	68.5	3.8	62.9	36302.0	4.73
13967	45590.9396057	396	-1	1.3150	1.0700	0.0000	68.5	3.8	62.9	36307.0	3.77
13967	45592.8725281	253	-1	0.5650	1.0400	0.0000	69.7	3.6	62.6	35526.0	4.65
13967	45585.6417847	266	187	0.6200	1.0200	0.6600	64.3	4.3	61.7	38388.0	4.73
13969	45478.5535126	303	229	2.1100	2.6600	1.2800	84.8	2.5	0.8	34018.0	4.68
13969	45478.0845032	237	708	1.4500	3.1000	0.6850	93.5	2.2	-0.7	29203.0	4.82
13969	45461.9408951	295	232	2.7200	3.6000	1.7050	81.5	3.7	0.0	34898.0	4.62

13969	45465.0199127	293	225	2.2300	2.9850	1.4750	85.4	2.5	-1.6	34536.0	4.65
13970	45465.8076630	288	259	1.0900	1.5100	0.6300	85.9	2.1	-0.1	34448.0	4.65
13970	45641.3364563	273	240	0.9600	1.4850	0.6750	89.3	0.8	0.4	34426.0	4.48
13971	45447.6257172	345	-1	0.7600	0.8100	0.0000	88.2	1.4	2.0	33882.0	4.72
13971	45474.5478516	206	201	0.5300	1.6300	0.9400	79.9	3.3	13.4	34429.0	4.45
13971	45478.9103851	282	210	1.5100	2.1800	1.1800	85.5	3.0	16.6	32724.0	4.59
13971	45537.8199615	281	234	5.9550	8.6950	4.0750	82.2	6.6	22.6	15453.0	5.69
13971	45465.8813477	267	213	1.0200	1.6600	0.8800	86.0	2.4	10.9	34342.0	4.56
13971	45498.8838806	264	229	2.4750	4.1100	1.9800	91.2	2.1	24.1	24902.0	4.89
13971	45605.4818420	281	283	33.7350	49.2750	18.7500	105.6	9.6	16.4	7286.0	7.80
13974	45471.4983826	281	210	1.2850	1.8800	1.0200	93.9	2.4	-0.6	35052.0	4.64
13974	45505.4995880	289	217	1.1750	1.6250	0.8400	95.3	2.0	1.2	35016.0	4.64
13974	45505.4995575	379	-1	0.5550	0.5000	0.0000	95.3	2.0	1.2	35021.0	7.42
13974	45484.9904480	296	254	1.6750	2.2000	0.9400	83.0	3.8	0.8	35358.0	4.62
13974	45485.9930420	287	248	1.4800	2.0750	0.9100	83.9	3.3	0.7	35232.0	4.63
13974	45528.0115204	234	383	1.2250	2.6900	0.8000	86.8	0.6	0.8	34891.0	4.68
13974	45551.9860382	232	364	1.2800	2.8700	0.8900	76.4	3.7	0.1	35140.0	4.60
13974	45552.9882660	256	180	1.0900	1.9450	1.3400	77.2	3.4	0.7	35074.0	4.65
13979	45647.8751526	338	-1	0.6350	0.7000	0.0000	94.3	5.3	-45.4	17498.0	12.78
13980	45440.0741959	394	-1	0.6300	0.5200	0.0000	93.3	3.2	-14.0	30828.0	5.61
13984	45479.6232910	225	-1	0.2800	0.6750	0.0000	86.2	2.0	-0.8	34987.0	5.54
13984	45481.6284943	291	242	1.7000	2.3050	1.0400	88.6	0.8	-0.2	34888.0	4.81
13984	45573.0671692	313	686	0.8100	0.9850	0.2200	121.7	4.9	0.3	35653.0	4.22
13984	45574.0691528	413	-1	1.2800	0.9800	0.0000	120.9	4.8	0.5	35613.0	9.80
13984	45574.0691071	261	-1	0.4850	0.8300	0.0000	120.9	4.8	0.5	35613.0	9.29
13990	45545.5499878	633	177	0.7450	0.3550	0.2500	90.9	2.2	23.6	33985.0	8.03
13990	45600.8003235	288	1083	0.6900	0.9600	0.1900	72.9	3.4	14.6	22421.0	5.22
14000	45623.9226685	488	192	1.2000	0.7400	0.4600	83.7	3.0	57.2	14239.0	24.52
14005	45512.2983704	250	244	1.7000	3.2050	1.4300	87.5	2.1	2.6	35781.0	4.65
14005	45516.3784180	235	309	1.6050	3.5000	1.2300	98.2	2.3	2.7	35818.0	4.64
14034	45569.2657623	282	315	1.6300	2.3650	0.8200	96.9	1.3	29.0	37822.0	4.41
14034	45525.2445679	254	234	1.1000	2.0000	0.9400	87.9	2.7	50.2	32894.0	4.70
14034	45553.2332611	288	230	1.0600	1.4700	0.7050	93.0	0.7	39.0	38306.0	4.46
14034	45596.3233948	244	448	3.4200	6.7800	1.8300	112.3	4.9	7.3	25847.0	4.58
14034	45579.1418457	272	242	1.5050	2.3550	1.0600	116.4	4.4	43.5	37561.0	4.39
14050	45504.6039276	297	192	0.7000	0.9100	0.5650	82.2	3.1	-0.2	35182.0	4.63
14050	45634.1090698	239	-1	0.8050	1.6800	0.0000	94.2	1.2	0.3	34940.0	12.32
14050	45634.1091309	351	-1	0.8950	0.9300	0.0000	94.2	1.2	0.3	34941.0	3.78
14050	45637.1145935	412	-1	0.6000	0.4600	0.0000	92.5	1.0	-0.2	34919.0	3.66
14069	45622.0515137	6923	251	2.1500	0.5100	0.2200	82.4	1.4	0.2	40831.0	3.94
14070	45570.0878448	324	256	3.1850	3.7200	1.5750	82.4	5.3	-34.6	8054.0	6.41
14077	45529.2331543	249	237	1.2150	2.3150	1.0700	88.0	4.6	-0.1	35713.0	4.57
14081	45512.5509033	399	215	7.3950	5.9150	3.0950	91.4	1.5	-4.6	19715.0	5.12
14081	45594.8620605	350	259	2.6200	2.7400	1.1450	68.8	3.1	23.1	33546.0	4.62
14081	45578.9019623	334	224	3.1200	3.4900	1.7300	59.6	5.7	18.6	29062.0	4.70

14081	45581.8378754	320	239	2.9700	3.5250	1.6150	60.1	5.2	19.6	29974.0	4.74
14095	45536.5450287	911	115	0.8400	0.3100	0.5600	81.1	1.1	55.7	129511.0	4.11
14095	45536.5450592	2208	-1	1.6000	0.4300	0.0000	81.1	1.1	55.7	129512.0	12.17
14095	45528.5970764	724	-1	0.6700	0.2900	0.0000	87.2	0.7	60.7	165079.0	3.82
14095	45650.6198120	497	-1	1.0050	0.6000	0.0000	96.2	2.2	67.7	97307.0	7.19
14114	45569.4140625	327	270	2.4150	2.7850	1.1100	97.3	1.9	0.9	34944.0	4.53
14114	45522.3931885	254	238	1.2750	2.3200	1.0700	91.3	0.2	0.2	34834.0	4.69
14115	45550.8407593	316	268	4.7850	5.7450	2.3150	90.0	2.8	-0.4	34786.0	4.63
14115	45525.0751343	2555	267	2.4950	0.5200	0.2100	83.7	2.4	-1.8	35071.0	10.65
14115	45647.8840027	263	246	1.7900	3.0100	1.3300	93.2	0.9	0.5	34654.0	4.40
14117	45550.1282196	314	292	4.9150	5.9450	2.1950	89.6	0.8	-0.8	34786.0	4.64
14130	45514.0902100	275	290	43.0300	65.4950	24.3500	85.7	6.4	-7.0	8859.0	7.47
14130	45608.0598450	299	453	5.0700	6.4900	1.7400	104.7	3.6	7.6	26427.0	4.80
14134	45602.4077454	259	290	1.5150	2.6400	0.9800	108.3	3.0	-0.0	35172.0	4.56
14158	45592.5704956	291	404	1.9450	2.6400	0.7550	67.2	4.4	-0.1	35516.0	4.46
14158	45599.5810547	290	236	1.9900	2.7150	1.2600	71.9	3.0	-0.2	35168.0	4.56
14158	45600.5829773	1032	159	0.7100	0.2450	0.2100	72.5	2.9	0.0	35139.0	4.83
14158	45627.0963135	272	290	1.3400	2.1000	0.7800	98.9	1.8	-0.1	35004.0	4.50
14158	45628.0981750	260	212	1.2550	2.1650	1.1600	98.1	1.7	-0.0	34967.0	4.49
14158	45629.0999756	279	226	1.5850	2.3500	1.1550	97.6	1.7	0.1	34967.0	4.35
14158	45630.1018066	278	234	1.5650	2.3400	1.1000	96.8	1.5	0.1	34955.0	4.45
14158	45631.1036377	1754	-1	1.3200	0.3850	0.0000	96.1	1.4	0.0	34944.0	5.77
14166	45626.9837952	629	322	0.9200	0.4400	0.1500	84.8	3.0	-28.3	33584.0	3.92
14168	45650.6785278	648	-1	1.2350	0.5800	0.0000	94.5	3.0	20.7	24580.0	4.04
14182	45524.3841248	308	226	8.8100	10.8900	5.3350	88.7	5.4	61.4	12733.0	6.65
14190	45614.9566650	396	335	4.8100	3.9050	1.2900	79.5	9.4	-54.5	12107.0	5.12
14193	45473.1082306	247	265	1.9600	3.7800	1.5400	79.3	3.4	-1.5	34680.0	4.68
14193	45569.3424683	266	191	1.4000	2.2900	1.4250	97.7	1.9	1.4	34591.0	4.62
14193	45463.2362671	250	252	2.0150	3.7850	1.6300	77.0	4.5	-1.0	34962.0	4.61
14194	45509.0794067	271	274	1.4200	2.2300	0.8750	91.6	0.1	1.9	35612.0	4.67
14194	45631.2468567	296	312	3.5400	4.6300	1.6150	95.7	1.3	-0.6	35665.0	4.47
14195	45536.5323791	287	289	4.0000	5.6000	2.0850	80.7	3.5	-1.3	35322.0	4.64
14195	45562.5814209	355	456	6.6050	6.7400	1.8000	88.1	0.6	-0.7	34956.0	4.55
14195	45597.5771790	328	2425	4.2200	4.8400	0.8550	70.8	3.1	-0.4	35287.0	4.57
14195	45598.5790710	303	291	4.1350	5.2000	1.9250	71.2	3.1	-0.4	35276.0	4.58
14195	45617.6146851	339	268	3.6950	4.0600	1.6350	79.1	2.1	-0.1	35088.0	4.51
14195	45618.6165466	273	285	2.3600	3.6700	1.3850	79.7	2.0	-0.3	35073.0	4.48
14195	45618.6164551	259	-1	0.7550	1.3100	0.0000	79.7	2.0	-0.3	35073.0	6.65
14195	45640.6568298	288	227	2.1250	2.9450	1.4350	88.3	0.8	0.8	34959.0	4.43
14195	45641.6586304	246	276	1.7000	3.3300	1.3000	88.7	0.8	0.8	34948.0	4.42
14206	45542.4945373	260	186	0.9100	1.5700	1.0250	89.6	2.8	54.2	22908.0	5.27
14206	45575.3481140	253	294	1.6400	3.0100	1.1050	118.5	8.1	48.7	19190.0	5.39
14206	45648.0512390	272	217	0.7100	1.1100	0.5750	87.8	3.8	60.4	38307.0	4.38
14258	45557.7952728	291	253	5.1600	7.0350	3.0150	83.2	5.6	54.9	18579.0	5.85
14258	45557.7952881	296	274	3.2650	4.2700	1.6800	83.2	5.6	54.9	18575.0	5.85

14258	45617.6056519	257	279	3.3050	5.8600	2.2600	80.6	6.6	-48.5	18696.0	5.62
14258	45585.3768616	297	274	7.9300	10.3200	4.0550	114.7	6.3	-7.8	18576.0	5.93
14259	45568.4175568	851	142	0.8350	0.3200	0.3500	98.5	4.2	-26.4	18441.0	7.90
14259	45561.5861664	278	320	2.2750	3.4050	1.1650	87.1	1.2	36.4	18280.0	5.93
14259	45587.7898102	292	243	6.9200	9.3600	4.2000	66.2	7.4	64.7	18813.0	5.82
14259	45580.5245514	592	-1	0.8000	0.4000	0.0000	114.6	7.6	-64.3	18781.0	3.83
14260	45561.5862884	297	276	3.2450	4.2250	1.6450	87.1	1.2	36.4	18282.0	5.94
14260	45590.6537781	285	381	0.8250	1.1700	0.3500	68.2	6.6	63.6	18704.0	3.92
14264	45570.5326843	296	283	7.2400	9.5100	3.6200	81.6	7.0	18.9	18757.0	5.80
14264	45571.9570007	276	233	7.7500	11.7050	5.5250	83.9	2.8	8.4	18332.0	5.96
14264	45565.5586853	248	264	7.6400	14.6300	5.9800	101.5	6.1	-46.8	18601.0	5.92
14264	45557.7952270	291	207	6.0000	8.1550	4.5200	83.2	5.6	54.9	18581.0	5.86
14264	45583.1365814	256	245	7.0050	12.4950	5.5500	62.7	7.0	62.8	18763.0	5.90
14264	45611.9532776	267	331	6.7050	10.9500	3.6550	77.1	6.7	-43.3	18704.0	5.68
14264	45579.1611175	272	297	9.3450	14.6100	5.3050	116.5	7.5	-56.3	18806.0	5.92
14264	45579.1611175	386	-1	0.5200	0.4500	0.0000	116.5	7.5	-56.3	18808.0	3.47
14277	45577.9692841	275	223	0.5100	0.7800	0.3900	59.4	8.2	6.2	17854.0	5.58
14287	45623.3738098	331	-1	0.4500	0.5100	0.0000	99.3	2.9	7.5	25890.0	4.86
14313	45592.9345093	348	249	2.9200	3.0800	1.3450	68.2	3.4	47.6	30541.0	4.88
14313	45587.7859802	295	266	1.9700	2.6100	1.0600	65.2	3.9	62.3	39002.0	4.59
14313	45601.5488281	82	228	0.5750	72.6700	35.2800	108.3	12.3	0.1	3352.0	18.94
14319	45579.6319733	279	186	0.8100	1.1950	0.7800	61.5	5.8	57.9	28558.0	4.94
14319	45588.9300842	390	116	0.6150	0.5200	0.9350	66.0	3.5	60.6	40128.0	4.65
14319	45631.3816833	271	239	2.5400	4.0000	1.8300	94.3	6.8	43.7	15909.0	5.75
14319	45631.3816528	815	-1	1.1500	0.4500	0.0000	94.3	6.8	43.7	15894.0	5.42
14369	45630.9944458	361	343	1.8700	1.8500	0.6000	86.9	2.9	-9.8	16301.0	4.90
14369	45643.0892334	504	225	1.1750	0.6900	0.3400	90.1	1.2	-1.8	22487.0	4.63

APPENDIX B
SATELLITES OBSERVED BY IRAS (AT LEAST ONCE)

This appendix identifies the 465 satellites observed by IRAS. This list contains the following information.

1. Air Force Space Surveillance Center identification number.
2. Year of launch.
3. International designator.
4. Country of origin.
5. Type of object: PL denotes a payload; RB, a rocket body; and DB is debris.
6. Status of the object.
7. Common name of object or a comment.
8. Inclination of the object, degrees.
9. Eccentricity of the object.
10. Semimajor axis of the object, earth radii.
11. Mean motion of the object, revolutions per day.

Sid	Year	Designation	Owner	Mission	Status	Comment	Inclination	Eccentricity	Semi major axis	Mean motion
20	1959	007A	USA	PL	NA	VANGUARD 3	33.3	.1880	1.330300	11.115000
282	1962	012B	USA	RB	NA	RANGER 4//RB (no element set)	.7	.1384	6.613023	1.002251
573	1963	013A	USA	PL	NA	TELSTAR 2	42.8	.4011	1.923095	6.392022
575	1963	013B	USA	RB	NA	TELSTAR 2//SDC 573	42.8	.4007	1.921426	6.400349
748	1964	006B	SOV	PL	NA	ELEKTRON 2	63.6	.6030	6.363943	1.061707
751	1964	006D	SOV	RB	NA	ELEKTRON 1//SDC 746	64.0	.5809	6.450280	1.040463
830	1964	038B	SOV	PL	AC	ELEKTRON 4	65.9	.8308	6.228553	1.096366
869	1964	049D	SOV	PL	NA	COSMOS 41	71.5	.6721	4.150794	2.015250
898	1964	049E	SOV	RB	NA	COSMOS 41//SDC 869	71.5	.6720	4.163013	2.006391
1360	1965	034B	USA	PL	AC	LES-2	32.2	.3971	2.378194	4.648185
1361	1965	034C	USA	PL	NA	LCS-1	32.1	.0010	1.236000	9.890000
2222	1966	053J	USA	RB	NA	OPS 9381//SDC 2207	11.9	.0162	6.341975	1.067199
2608	1966	110A	USA	PL	IN	ATS 1	13.5	.0045	6.606596	1.003723
2643	1967	001D	USA	DB	IN	INTELSAT IIF-2//SDC 2639	26.9	.6492	2.996155	3.287286
2653	1967	003F	USA	PL	IN	OPS 9326 (IDCSP-13)	11.4	.0034	6.300318	1.077799
2868	1967	066G	USA	RB	NA	OPS 9331//SDC 2862	9.5	.0049	6.246769	1.091676
3029	1967	111A	USA	PL	IN	ATS 3// SYNCTM 1050Z	13.1	.0024	6.610919	1.002733
3292	1968	050J	USA	RB	NA	IDCSP 4-1,6 Transtage	12.1	.0168	6.386718	1.055998
3307	1968	055A	USA	PL	IN	EXPLORER 38	120.8	.0011	1.916780	6.422126
3431	1968	081D	USA	PL	AC	LES 6//SYNCTM 1330Z	11.3	.0009	6.610243	1.002895
3432	1968	081E	USA	RB	NA	LES-6//SDC 3431	11.0	.0090	6.559110	1.014639
3848	1968	055C	USA	DB	NA	EXPLORER 38//SDC 3307	120.8	.0014	1.916242	6.424930
3954	1969	046D	USM	PL	AC	VELA//OPS 6909	61.6	.2914	18.456831	.214949
3955	1969	046E	USM	PL	AC	VELA//OPS 6911	61.1	.3332	18.452632	.215107
4353	1970	021A	NAT	PL	NA	NATO I	11.3	.0002	6.611288	1.002646
4354	1970	021B	USM	RB	NA	NATO I//SDC 4353	26.1	.7008	3.595968	2.500028
4366	1970	027A	USM	PL	AC	VELA//OPS 7033	61.2	.0849	18.441386	.215341
4368	1970	027B	USM	PL	AC	VELA//OPS 7044	57.4	.0668	18.472443	.214696
4478	1970	055A	ITS	PL	NA	INTELSAT IIIF-8	13.1	.0336	6.524887	1.022637

Sid	Year	Designation	Owner	Mission	Status	Comment	Inclination	Eccentricity	Semi major axis	Mean motion
4630	1970	093A	USA	PL	IN	OPS 5960	15.7	.1366	5.858588	1.201954
4881	1971	006A	ITS	PL	NA	INTELSAT IVF-2	10.6	.0037	6.674583	.988434
4882	1971	006B	USA	RB	NA	INTELSAT IVF-2//SDC 4881	27.4	.7192	3.911328	2.203818
4902	1971	009A	NAT	PL	IN	NATO IIB//DO NOT ATTEMPT TO T	11.6	.0211	6.611293	1.002657
4925	1964	086B	USA	DB	NA	Explorer 26 Fragments	19.8	.5095	2.141244	5.442057
5204	1971	039A	USM	PL	NA	OPS 3811 MEWS 2	8.6	.0008	6.706388	.981406
5205	1971	039B	USM	DB	NA	OPS 3811 MEWS 2//SDC 5204	9.2	.0111	6.604062	1.004298
5589	1971	095C	USA	RB	NA	DSCS 1//SDC 5587	12.0	.0165	6.750073	.971874
5598	1971	096A	USA	PL	NA	EXPLORER 45	3.2	.5734	2.444160	4.462531
5816	1972	003B	USA	RB	NA	INTELSAT IVF-4//SDC 5775	28.3	.7185	3.910264	2.204621
5851	1972	010A	USM	PL	AC	OPS 1570 IMEWS 3	.2	.0060	6.595500	1.007063
5991	1969	069C	USA	RB	NA	ATS 5//SDC 4068	17.2	.6703	4.024681	2.111305
6052	1972	041A	ITS	PL	NA	INTELSAT IVF-5	8.5	.0003	6.618852	1.000938
6058	1972	041B	USA	RB	NA	INTELSAT IVF-5//SDC 6052	27.2	.7229	3.901311	2.212246
6192	1972	072A	SOV	PL	IN	COSMOS 520	67.7	.6219	4.153195	2.013576
6278	1972	090A	CAN	PL	NA	ANIK A1	8.5	.0024	6.675102	.988313
6302	1972	072E	SOV	RB	NA	COSMOS 520//SDC 6192	67.6	.6170	4.120567	2.037535
6437	1973	023A	CAN	PL	NA	ANIK A2	7.2	.0007	6.631945	.997984
6691	1973	040A	USA	PL	AC	OPS 6157 MEWS 4	7.2	.0009	6.630756	.998236
6779	1967	001X	USA	DB	NA	INTELSAT IIF-2//SDC 2639	28.1	.7178	3.923480	2.193502
6877	1973	076A	SOV	PL	AC	MOLNIYA 2-7	64.2	.7540	4.183995	1.991358
6893	1973	078A	USA	PL	AC	IMP 8	47.3	.1234	35.158855	.081754
6898	1973	076d	SOV	RB	NA	MOLNIYA 2-7//SDC 6877	62.9	.7410	4.223020	1.964020
6916	1973	084A	SOV	PL	IN	COSMOS 606	67.9	.6489	4.166774	2.003682
6939	1973	084D	SOV	RB	NA	COSMOS 606//SDC 6916	67.6	.6502	4.119941	2.037931
6958	1973	097A	SOV	PL	AC	MOLNIYA 1-26	64.0	.7378	4.163324	2.006199
6974	1973	100B	USM	PL	AC	OPS 9434 DSCS 4	10.9	.0063	6.611143	1.002694
6976	1973	100D	USA	RB	NA	OPS 9433-9434//SDC 6973	11.7	.0271	6.850786	.950524
7000	1973	106A	SOV	PL	AC	MOLNIYA 2-8	63.9	.7476	4.162363	2.006889
7178	1973	097D	SOV	RB	NA	MOLNIYA 1-26//SDC 6958	64.2	.7354	4.228946	1.959730

Sid	Year	Designation	Owner	Mission	Status	Comment	Inclination	Eccentricity	Semi major axis	Mean motion
7250	1974	022A	USA	PL	NA	WESTAR 1	6.8	.0005	6.627711	.998937
7260	1974	023A	SOV	PL	AC	MOLNIYA 1-27	64.1	.7509	4.157048	2.010475
7264	1974	023E	SOV	RB	NA	MOLNIYA 1-27//SDC 7260	64.1	.7553	4.205795	1.975901
7276	1974	026A	SOV	PL	NA	MOLNIYA 2-9	62.6	.7363	3.900813	2.212090
7318	1974	039A	USA	PL	NA	ATS 6	10.7	.0030	6.536818	1.019838
7324	1974	039C	USA	RB	NA	ATS 6//SDC 7318	10.9	.0021	6.593466	1.006711
7354	1974	050C	SOV	RB	NA	COSMOS 665//SDC 7352	62.4	.7464	4.031656	2.105105
7369	1974	054A	USA	PL	AC	OPS 7518 NTS1 (TIMATION 3)	125.1	.0079	3.133876	3.072146
7372	1973	106D	SOV	RB	NA	MOLNIYA 2-8 // SDC 7000	64.2	.7384	4.224188	1.962997
7373	1974	026E	SOV	RB	NA	MOLNIYA 2-9//SDC 7276	63.0	.7539	4.213054	1.970793
7376	1974	056A	SOV	PL	IN	MOLNIYA 2-10	61.8	.7282	4.163997	2.005808
7382	1974	056D	SOV	RB	NA	MOLNIYA 2-10//SDC 7382	62.3	.7446	4.218274	1.967182
7468	1974	075C	USA	RB	NA	WESTAR 2//SDC 7466	24.4	.5651	2.368725	4.676869
7480	1974	081A	SOV	PL	DD	MOLNIYA 1-28//29 DEC 1985	63.4	.7444	3.968185	2.154764
7485	1974	081D	SOV	DD	NA	MOLNIYA 1-28//SDC 7480//27 OC	63.1	.7501	4.030396	2.106265
7540	1974	092A	SOV	PL	DD	MOLNIYA 3-1//15 MAY 1986	62.9	.1347	1.178695	13.290740
7545	1974	093B	USA	RB	NA	INTELSAT IVF-8//SDC 7544	25.5	.7235	3.908513	2.206224
7546	1974	092E	SOV	DB	NA	MOLNIYA 3-1//SDC 7540	64.0	.7555	4.194397	1.983940
7583	1974	102A	SOV	PL	DD	MOLNIYA 2-11//07 JUL 1988	61.9	.3008	1.453230	9.727411
7586	1974	102D	SOV	RB	NA	MOLNIYA 2-11//SDC 7583	62.0	.6616	2.997658	3.283689
7625	1975	007A	SOV	PL	NA	COSMOS 706	67.8	.5069	4.160392	2.008410
7629	1975	007D	SOV	RB	NA	COSMOS 706//SDC 7625	67.6	.5280	4.159821	2.008818
7641	1975	009A	SOV	PL	DD	MOLNIYA 2-12//04 JUL 1985	63.9	.7379	3.889347	2.221856
7653	1975	009D	SOV	RB	NA	MOLNIYA 2-12//SDC 7641	63.9	.7455	3.998651	2.131066
7738	1975	029A	SOV	PL	DD	MOLNIYA 3-2//29 NOV 1988	62.0	.2420	1.336683	11.026730
7741	1975	029D	SOV	RB	NA	MOLNIYA 3-2//SDC 7738	62.3	.7551	4.176679	1.996637
7780	1975	036A	SOV	PL	IN	MOLNIYA 1-29	63.2	.7410	4.163366	2.006173
7790	1975	038A	CAN	PL	NA	ANIK A3	6.0	.0002	6.621058	1.000451
7794	1975	038D	USA	RB	NA	ANIK A3//SDC 7790	24.6	.6448	2.932804	3.394490
7800	1975	036D	SOV	RB	NA	MOLNIYA 1-29//SDC 7780	63.7	.7289	4.221763	1.964718

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7902	1975	042B	USA	RB	NA	INTELSAT IVF-1//SDC 7815	26.1	.7216	3.911072	2.203979
7903	1975	049A	SOV	PL	DD	MOLNIYA 1-30//12 AUG 1987	62.8	.7267	3.731215	2.362655
8015	1975	063A	SOV	PL	NA	MOLNIYA 2-13	63.4	.7400	4.163128	2.006343
8018	1975	063D	SOV	RB	NA	MOLNIYA 2-13//SDC 8015	63.8	.7293	4.221963	1.964575
8134	1975	077C	USA	RB	NA	SYMPHONIE B//SDC 8132	13.7	.7277	3.882609	2.228435
8187	1975	079A	SOV	PL	DD	MOLNIYA 1-31//19 NOV 1986	63.8	.6751	3.123115	3.087744
8195	1975	081A	SOV	PL	IN	MOLNIYA 2-14	63.1	.7452	4.163234	2.006262
8274	1975	079E	SOV	RB	DD	MOLNIYA 1-31//SDC 8187//08 JU	63.3	.7236	3.654255	2.439685
8331	1975	091B	USA	RB	NA	INTELSAT IVAF-1//SDC 8330	21.7	.7216	3.909765	2.205187
8366	1975	100A	USA	PL	AC	SMS C-GOES 1// SYNCTM 1120Z	9.6	.0002	6.610121	1.002910
8418	1975	081D	SOV	RB	NA	MOLNIYA 2-14//SDC 8195	63.7	.7385	4.225118	1.962362
8425	1975	105A	SOV	PL	IN	MOLNIYA 3-3	63.3	.7404	4.163919	2.005770
8462	1975	105D	SOV	RB	NA	MOLNIYA 3-3//SDC 8425	63.8	.7334	4.225243	1.962282
8476	1975	117A	USA	PL	AC	RCA Satcom 1	0.0	.0001	6.610865	1.002646
8482	1975	118A	USM	PL	AC	OPS 3165 MEWS 5	5.0	.0014	6.600486	1.005112
8492	1975	121A	SOV	PL	NA	MOLNIYA 2-15	62.8	.6703	3.089751	3.137869
8521	1975	125A	SOV	PL	DD	MOLNIYA 3-4//12 AUG 1986	63.4	.6914	3.290762	2.854843
8529	1975	121D	SOV	RB	DD	MOLNIYA 2-15//SDC 8492//13 OC	63.8	.7319	3.760229	2.337269
8547	1975	123E	SOV	DB	NA	RADUGA 1//SDC 8513	46.5	.6410	2.857945	3.527971
8548	1975	049E	SOV	RB	NA	MOLNIYA 1-30//SDC 7903	62.7	.7071	3.529642	2.570071
8585	1976	004A	CAN	PL	NA	CTS A	10.2	.0017	6.613727	1.002104
8600	1975	125F	SOV	RB	DD	MOLNIYA 3-4//SDC 8521//30 JUL	63.8	.7178	3.572281	2.524123
8601	1976	006A	SOV	PL	IN	MOLNIYA 1-32//TT	63.5	.7255	4.174432	1.998236
8620	1976	010A	ITS	PL	NA	INTELSAT IVAF-2	5.9	.0006	6.636881	.996858
8621	1976	010B	USA	RB	NA	INTELSAT IVAF-2//SDC 8620	22.0	.7202	3.913463	2.202021
8701	1976	006D	SOV	RB	NA	MOLNIYA 1-32//SDC 8601	63.6	.7280	4.076651	2.070525
8741	1976	021A	SOV	PL	IN	MOLNIYA 1-22	62.7	.7519	4.154772	2.012438
8751	1976	023F	USA	RB	NA	LES 8-9//SDC 8746-8747	20.1	.0140	6.700733	.982643
8762	1976	026A	SOV	PL	AC	MOLNYIA 1-34	64.0	.7263	4.162679	2.006672
8774	1976	029A	USA	PL	NA	RCA B (SATCOM II)	5.5	.0060	6.684373	.986265

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8820	1976	039A	USA	PL	NA	LAGEOS I	109.9	.0039	1.923765	6.386718
8822	1976	039C	USA	DB	NA	LAGEOS//SDC 8820	109.9	.0038	1.923371	6.388686
8833	1976	041A	SOV	PL	IN	MOLNIYA 3-5	62.2	.7399	3.910050	2.203367
8838	1976	042A	USA	PL	IN	COMSTAR 1-D1	5.7	.0002	6.631016	.998169
8840	1976	042B	USA	RB	NA	COMSTAR 1-D1//SDC 8838	21.6	.7159	3.891330	2.220879
8844	1976	041D	SOV	RB	NA	MOLNIYA 3-5//SDC 8833	61.9	.7536	4.133384	2.028069
8882	1976	053A	USA	PL	AC	MARISAT B (MARISAT 3)	7.4	.0002	6.610943	1.002729
8910	1976	053F	USA	RB	NA	MARISAT B (MARISAT 3)//SDC 88	25.4	.6807	3.265319	2.889287
8916	1976	059A	USM	PL	AC	OPS 2112 MEWS 6	5.0	.0004	6.611030	1.002708
8918	1976	059C	USM	RB	NA	OPS 2112 MEWS 6//SDC 8916	.5	.0030	6.603496	1.004675
9007	1976	065B	USM	PL	AC	OPS 3986 SESP 74-2	97.4	.1940	1.283459	11.715864
9009	1976	066A	IND	PL	NA	PALAPA A	4.6	.0003	6.621068	1.000428
9017	1976	066C	USA	RB	NA	PALAPA A//SDC 9009	24.6	.6069	2.642385	3.969319
9047	1976	073A	USA	PL	AC	COMSTAR 1-D2	5.6	.0000	6.610944	1.002703
9049	1976	074A	SOV	PL	DD	MOLNIYA 1-39//TT//29 MAY 1987	63.4	.6826	3.212861	2.959299
9269	1976	074E	SOV	RB	NA	MOLNIYA 1-35//SDC 9049	62.6	.7276	4.032701	2.104541
9329	1976	073B	USA	RB	NA	COMSTAR 1-D2//SDC 9047	21.4	.7178	3.882406	2.228535
9330	1974	101G	USA	RB	NA	SYMPHONIE A//SDC 7578	13.0	.7303	3.933712	2.185157
9411	1976	021D	SOV	RB	NA	MOLNIYA 1-23//SDC 8741	63.0	.7383	4.214503	1.969832
9478	1976	101A	USA	PL	AC	MARISAT C (MARISAT 2)	9.0	.0001	6.611142	1.002685
9495	1976	105A	SOV	PL	NA	COSMOS 862//TT	67.1	.6965	4.162677	2.006607
9506	1976	105D	SOV	RB	NA	COSMOS 862//SDC 9495	66.4	.6967	4.140154	2.023012
9574	1976	116A	SOV	PL	IN	MOLNIYA 2-16	62.1	.7434	4.163913	2.005853
9579	1976	116D	SOV	RB	NA	MOLNIYA 2-16//SDC 9574	62.3	.7316	4.217925	1.967464
9635	1976	127A	SOV	PL	NA	MOLNIYA 3-6	59.5	.4918	2.099146	5.603660
9647	1976	127E	SOV	RB	DD	MOLNIYA 3-6//SDC 9635//30 SEP	63.9	.5003	2.025750	5.910550
9829	1977	010A	SOV	PL	IN	MOLNIYA 2-17	63.7	.7167	4.163096	2.006418
9850	1977	010E	SOV	RB	NA	MOLNIYA 2-17//SDC 9829	64.1	.6972	4.214698	1.969703
9852	1977	014A	JPN	PL	NA	ETS 2//KIKU 2	9.1	.0009	6.613187	1.002210
9880	1977	021A	SOV	PL	IN	MOLNIYA 1-36	63.7	.7241	4.163273	2.006281

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9889	1976	105F	SOV	DB	NA	COSMOS 862//SDC 9495	67.0	.6986	4.165429	2.004620
9911	1977	027A	SOV	PL	NA	COSMOS 903	67.5	.6355	4.163897	2.005828
9921	1977	027D	SOV	RB	NA	COSMOS 903//SDC 9911	67.7	.6469	4.187609	1.988807
9927	1977	021D	SOV	RB	NA	MOLNIYA 1-30//SDC 9880	64.0	.7044	4.221640	1.964843
9931	1977	029A	ESA	PL	NA	ESRO-GEOS 1	27.6	.6604	4.226484	1.961763
9933	1977	029C	ESA	RB	NA	ESA-GEOS 1 //SDC 9931 (3RD ST)	26.0	.3153	1.514224	9.152373
9941	1977	032A	SOV	PL	IN	MOLNIYA 3-7	63.7	.7216	4.163304	2.006261
10000	1977	034A	USM	PL	NA	OPS 9437	9.3	.0019	6.774168	.966703
10001	1977	034B	USM	PL	NA	OPS 9438	8.9	.0036	6.832878	.954265
10002	1977	034C	USM	RB	NA	OPS 9437-9438//SDC 10000-1000	9.5	.0282	6.826526	.955599
10025	1977	041B	USA	RB	NA	INTELSAT IVAF-4//SDC 10024	21.2	.7206	3.890417	2.221650
10059	1977	047A	SOV	PL	NA	COSMOS 917	67.6	.5360	4.162015	2.007234
10061	1977	048A	USA	PL	AC	GOES B// SYNCTM 1415Z	7.9	.0032	6.600820	1.005040
10089	1977	047D	SOV	RB	NA	COSMOS 917//SDC 10059	67.4	.5570	4.181278	1.993376
10091	1977	053A	USM	PL	AC	NTS 2	64.6	.0052	4.164829	2.005211
10092	1977	054A	SOV	PL	IN	MOLNIYA 1-37	63.0	.7199	4.163270	2.006319
10143	1977	065A	JPN	PL	NA	GMS 1//HIMAWARI 1	8.1	.0015	6.656323	.992504
10150	1977	068A	SOV	PL	NA	COSMOS 931	67.2	.5751	4.162650	2.006765
10155	1977	052D	SOV	RB	NA	MOLNIYA 1-37//SDC 10092	63.5	.7066	4.076504	2.070701
10159	1977	071A	SOV	PL	IN	RADUGA 3	10.0	.0028	6.607962	1.003420
10167	1977	068D	SOV	RB	NA	COSMOS 931//SDC 10150	68.2	.5782	4.134114	2.027551
10315	1977	082A	SOV	PL	IN	MOLNIYA 1-38	62.7	.7290	4.024304	2.111113
10369	1977	082E	SOV	RB	NA	MOLNIYA 1-38//SDC 10315	63.9	.7295	3.834542	2.269660
10422	1977	102E	USA	PL	DD	ISEE A//26 SEP 1987	8.7	.9126	11.833726	.418747
10455	1977	105A	SOV	PL	IN	MOLNIYA 3-8	63.5	.6908	4.164077	2.005745
10485	1977	105E	SOV	RB	NA	MOLNIYA 3-8//SDC 10455	63.6	.6820	4.216482	1.968477
10489	1977	108A	ESA	PL	NA	METEOSAT 1	9.1	.0017	6.613294	1.002199
10516	1977	118A	JPN	PL	NA	CS//SAKURA	7.5	.0001	6.671310	.989153
10557	1978	002A	ITS	PL	NA	INTELSAT IVAF-3	4.1	.0003	6.626796	.999133
10605	1978	009A	SOV	PL	NA	MOLNIYA 3-9	63.5	.0612	1.076795	15.248947

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10669	1978	016A	USM	PL	AC	FLTSATCOM 1//OPS 6391	8.2	.0003	6.611457	1.002604
10684	1978	020A	USM	PL	AC	GPS 1//OPS 5111//NAVSTAR 1	63.7	.0116	4.164326	2.005591
10696	1978	024A	SOV	PL	IN	MOLNIYA 1-39	62.0	.7351	4.164045	2.005774
10722	1978	002B	USA	RB	NA	INTELSAT IVAF-3//SDC 10557	21.0	.7186	3.898747	2.214531
10723	1978	012C	USA	RB	NA	IUE//SDC 10637	29.5	.7194	3.743703	2.353406
10778	1978	035A	ITS	PL	NA	INTELSAT IVAF-6	4.2	.0008	6.609938	1.002966
10779	1978	035B	USA	RB	NA	INTELSAT IVAF-6//SDC 10778	21.6	.7193	3.889729	2.222265
10794	1978	039C	JPN	RB	NA	BSE//SDC 10792	27.0	.4609	1.928681	6.365893
10801	1978	020B	USM	RB	NA	GPS 1//OPS 5111//SDC 10684	63.9	.4848	2.160974	5.364645
10802	1978	009E	SOV	RB	NA	MOLNIYA 3-9//SDC 10609	63.6	.7367	3.871656	2.237114
10803	1978	024D	SOV	RB	NA	MOLNIYA 1-39//SDC 10696	62.2	.7369	4.206771	1.975288
10855	1978	044A	ESA	PL	AC	OTS 2	6.3	.0002	6.611729	1.002554
10893	1978	047A	USM	PL	AC	GPS 2//OPS 5112//NAVSTAR 2	64.4	.0163	4.164458	2.005478
10894	1978	047B	USM	RB	NA	GPS 2//OPS 5112//SDC 10893	64.0	.5031	2.258748	5.020137
10925	1978	055A	SOV	PL	IN	MOLNIYA 1-40	63.3	.6918	4.163670	2.006045
10949	1978	055F	SOV	RB	NA	MOLNIYA 1-40//SDC 10925	63.5	.6898	4.220153	1.965909
10950	1977	108C	USA	RB	NA	METEOSAT//SDC 10489	27.1	.2215	1.317697	11.275614
10955	1978	062C	USA	RB	NA	GOES 3 (3rd Stage)//SDC 10953	23.7	.1873	1.260109	12.058846
10960	1977	053B	USA	RB	NA	NTS 2//SDC 10091	64.5	.5191	2.401229	4.580037
10970	1978	066A	SOV	PL	NA	COSMOS 1024	67.8	.5486	4.163185	2.006375
10976	1978	068B	USA	RB	NA	COMSTAR D3//SDC 10975	22.0	.7160	3.893121	2.219335
10981	1978	071A	ESA	PL	NA	GEOS 2// SYNCTM 1535	9.0	.0001	6.650649	.993907
10983	1978	071C	USA	RB	NA	GEOS 2//SDC 10981	25.8	.6607	3.056156	3.190985
10984	1978	092A	SOV	PL	IN	MOLNIYA 1-41	62.0	.7392	4.036654	2.101448
10987	1978	073A	SOV	PL	IN	RADUGA 4	9.5	.0011	6.607476	1.003522
10998	1978	066D	SOV	RB	NA	COSMOS 1024//SDC 10970	67.8	.5550	4.172478	1.999676
11007	1978	080A	SOV	PL	NA	MOLNIYA 1-42	63.8	.7213	4.163450	2.006160
11015	1978	083A	SOV	PL	NA	COSMOS 1030	67.6	.6031	4.161069	2.007874
11028	1978	087B	JPN	RB	NA	EXOS B//SDC 11027	31.2	.6088	2.648467	3.955425
11054	1978	093A	USM	PL	AC	GPS 3//OPS 5113//NAVSTAR 3	63.9	.0062	4.164176	2.005687

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11057	1978	095A	SOV	PL	NA	MOLNIYA 3-10	63.1	.7034	4.164613	2.005360
11073	1978	072D	SOV	RB	NA	MOLNIYA 1-41//SDC 10984	62.4	.7449	4.074208	2.072444
11075	1978	080D	SOV	RB	NA	MOLNIYA 1-42//SDC 11007	64.2	.7068	4.219564	1.966293
11076	1978	083D	SOV	RB	NA	COSMOS 1030//SDC 11015	65.9	.6226	4.184862	1.990802
11079	1978	095E	SOV	RB	NA	MOLNIYA 3-10//SDC 11057	63.2	.7109	4.226787	1.961273
11136	1978	109J	SOV	RB	NA	COSMOS 1051-1058/SDC 11128-35	74.0	.0140	1.250081	12.189368
11141	1978	112A	USM	PL	AC	GPS 4//OPS 5114//NAVSTAR 4	63.7	.0059	4.164266	2.005628
11142	1978	112B	USM	RB	NA	GPS 4//OPS 5114//SDC 11141	63.6	.5035	2.168458	5.336896
11144	1978	113A	USM	PL	AC	OPS 9441 DSCS 11	6.8	.0004	6.608731	1.003227
11145	1978	113B	USM	PL	AC	OPS 9442 DSCS 12	6.7	.0006	6.610930	1.002732
11153	1978	116A	CAN	PL	NA	ANIK B	3.5	.0006	6.630908	.998216
11158	1978	118A	SOV	PL	IN	GORIZONT 1	19.0	.3336	6.610774	1.002778
11240	1979	004A	SOV	PL	IN	MOLNIYA 3-11	63.9	.6845	4.164276	2.005596
11256	1979	007A	USA	PL	AC	SCATHA//OPS 7802//CHECK SYNCT	7.2	.1653	6.547909	1.017236
11273	1979	015A	SOV	PL	IN	EKRAN 3	9.1	.0038	6.613513	1.002139
11328	1979	031A	SOV	PL	DD	MOLNIYA 1-43//09 DEC 1989	63.8	.3890	1.660161	7.966534
11353	1979	038A	USM	PL	AC	FLTSATCOM 2//OPS 6392	6.9	.0008	6.610962	1.002737
11384	1979	048A	SOV	PL	IN	MOLNIYA 3-12	63.5	.7310	3.779156	2.319734
11436	1979	053C	USM	RB	NA	OPS 7484 MEWS 9//SDC 11397	1.5	.0057	6.648204	.994304
11440	1979	062A	SOV	PL	IN	GORIZONT 2	8.6	.0010	6.612037	1.002478
11474	1979	070A	SOV	PL	IN	MOLNIYA 1-44	63.9	.6755	4.164073	2.005753
11509	1979	077A	SOV	PL	NA	COSMOS 1124	68.1	.5850	4.159958	2.008682
11550	1979	077D	SOV	RB	NA	COSMOS 1124//SDC 11509	68.1	.5907	4.186651	1.989503
11551	1979	031D	SOV	RB	NA	MOLNIYA 1-43//SDC 11328	64.1	.7343	3.814105	2.287917
11553	1979	004D	SOV	RB	NA	MOLNIYA 3-11//SDC 11240	64.2	.6738	4.222107	1.964541
11554	1979	048D	SOV	RB	NA	MOLNIYA 3-12//SDC 11384	63.9	.2619	1.382547	10.482293
11555	1979	058D	SOV	RB	NA	COSMOS 1109//SDC 11417	67.4	.6609	4.178737	1.995147
11556	1979	070D	SOV	RB	NA	MOLNIYA 1-44//SDC 11474	64.2	.6723	4.222480	1.964282
11567	1974	017F	SOV	RB	NA	COSMOS 637//SDC 7229	11.2	.0047	6.578940	1.010059
11569	1976	107F	SOV	RB	NA	EKRAN 1//SDC 9503	10.3	.0012	6.559342	1.014575

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11570	1977	071F	SOV	RB	NA	RADUGA 3//SDC 10159	10.3	.0011	6.724728	.977378
11571	1977	092F	SOV	RB	NA	EKRAN 2//SDC 10365	9.8	.0009	6.566949	1.012815
11589	1979	091A	SOV	PL	IN	MOLNIYA 1-45	63.2	.7422	4.163954	2.005754
11602	1979	091D	SOV	RB	NA	MOLNIYA 1-45//SDC 11589	63.9	.7445	4.218978	1.966625
11621	1979	098A	USM	PL	AC	OPS 9443 DSCS 13 (Type 2)	6.3	.0001	6.610884	1.002734
11623	1979	098C	USM	RB	NA	OPS 9443-9444//SDC 11622 AND	7.5	.0280	6.838063	.953190
11635	1979	101A	USA	PL	NA	SATCOM C	9.7	.4845	4.434398	1.825425
11661	1979	105D	SOV	DB	NA	GORIZONT 3 4TH STAGE FRAGMENTS	46.6	.3902	1.538147	7.839730
11662	1980	002A	SOV	PL	IN	MOLNIYA 1-46	64.0	.7271	4.163677	2.005994
11670	1980	002F	SOV	RB	NA	MOLNIYA 1-46//SDC 11662	64.4	.7162	4.221082	1.965228
11676	1975	097F	SOV	RB	NA	COSMOS 775//SDC 8357	11.1	.0029	6.619022	1.000895
11684	1979	105E	SOV	RB	NA	GORIZONT 3//SDC 11648	8.4	.0016	6.681624	.986858
11690	1980	011A	USM	PL	AC	GPS 5//OPS 5117//NAVSTAR 5	64.2	.0113	4.164337	2.005584
11705	1980	011B	USM	RB	NA	GPS 5//OPS 5117//SDC 11690	63.5	.5261	2.274022	4.969638
11708	1980	016A	SOV	PL	IN	RADUGA 6	8.5	.0018	6.611372	1.002642
11715	1980	018A	JPN	PL	NA	ECS 2//AYAME 2	6.3	.0002	6.609124	1.003142
11718	1980	018C	JPN	RB	NA	ECS B//SDC 11715	24.4	.6008	2.598766	4.069713
11728	1980	016D	SOV	RB	NA	RADUGA 6//SDC 11708	8.7	.0016	6.729967	.976243
11758	1980	028A	SOV	PL	IN	COSMOS 1172	66.1	.6447	4.164949	2.005095
11762	1980	028E	SOV	RB	NA	COSMOS 1172//SDC 11758	66.7	.6610	4.180736	1.993731
11783	1980	032A	USM	PL	AC	GPS 6//OPS 5118//NAVSTAR 6	63.7	.0149	4.164278	2.005609
11791	1980	032B	USM	RB	NA	GPS 6//OPS 5118//SDC 11783	63.2	.4815	2.006176	5.997338
11844	1980	050A	SOV	PL	NA	COSMOS 1188	67.4	.6158	4.164143	2.005675
11847	1980	050B	SOV	RB	NA	COSMOS 1188//SDC 11844	67.4	.6149	4.182963	1.992157
11856	1980	053A	SOV	PL	IN	MOLNIYA 1-47	64.2	.7503	4.161057	2.007813
11861	1980	053D	SOV	RB	NA	MOLNIYA 1-47//SDC 11856	64.6	.7487	4.221669	1.964740
11862	1980	049F	SOV	RB	NA	GORIZONT 4//SDC 11841	8.1	.0028	6.715475	.979415
11871	1980	057A	SOV	PL	NA	COSMOS 1191	67.9	.5791	4.158619	2.009652
11888	1980	057D	SOV	RB	NA	COSMOS 1191//SDC 11871	67.9	.5876	4.179726	1.994454
11896	1980	063A	SOV	PL	IN	MOLNIYA 3-13	63.6	.7226	4.163391	2.006174

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11909	1980	063D	SOV	RB	NA	MOLNIYA 3-13//SDC 11896	64.0	.7282	4.220178	1.965810
11926	1978	118C	SOV	RB	NA	GORIZONT 1//SDC 11158	18.9	.3315	6.553401	1.015970
11940	1973	040B	USM	RB	NA	OPS 6157 MEWS 4//SDC 6691	7.6	.0041	6.642875	.995506
11941	1978	073E	SOV	RB	NA	RADUGA 4//SDC 10987	9.7	.0017	6.732621	.975658
11964	1980	074A	USA	PL	AC	GOES D	6.3	.0031	6.657232	.992292
12032	1980	085A	SOV	PL	IN	COSMOS 1217	67.3	.6138	4.157970	2.010150
12035	1980	085D	SOV	RB	NA	COSMOS 1217//SDC 12032	67.5	.6333	4.179682	1.994493
12065	1980	091A	USA	PL	AC	SBS A//AKA AT3 3F3	2.9	.0013	6.611227	1.002678
12066	1980	092A	SOV	PL	IN	MOLNIYA 1-48	64.1	.7333	4.148413	2.017025
12070	1980	092D	SOV	RB	NA	MOLNIYA 1-48//SDC 12066	64.4	.7268	4.224519	1.962780
12078	1980	095A	SOV	PL	NA	COSMOS 1223	67.8	.5977	4.164952	2.005070
12086	1980	095E	SOV	RB	NA	COSMOS 1223//SDC 12078	67.6	.6115	4.184700	1.990894
12120	1980	104A	SOV	PL	IN	EKRAN 6	7.9	.0003	6.608718	1.003252
12133	1981	002A	SOV	PL	IN	MOLNIYA 3-14	64.0	.6837	4.163580	2.006105
12134	1981	002B	SOV	RB	NA	MOLNIYA 3-14//SDC 12133	64.3	.6830	4.219042	1.966676
12156	1981	009A	SOV	PL	NA	MOLNIYA 1-49	64.0	.6950	4.162963	2.006515
12159	1981	009D	SOV	RB	NA	MOLNIYA 1-49//SDC 12156	64.3	.7000	4.217012	1.968052
12295	1981	012A	JPN	PL	NA	KIKU 3//ETS 4	28.2	.6583	3.041901	3.213384
12303	1981	016A	SOV	PL	IN	COSMOS 1247	67.8	.6024	4.137721	2.024890
12309	1981	018A	USA	PL	AC	COMSTAR D4	4.1	.0001	6.611088	1.002697
12311	1981	016E	SOV	RB	NA	COSMOS 1247//SDC 12303	67.6	.5996	4.108122	2.046815
12339	1981	025A	USM	PL	AC	OPS 7350 MEWS 11	.1	.0006	6.611220	1.002665
12363	1981	018B	USA	RB	NA	COMSTAR D4//SDC 12309	20.1	.7168	3.896993	2.216042
12368	1981	030A	SOV	PL	IN	MOLNIYA 3-15	64.8	.7148	4.163061	2.006438
12371	1981	025C	USM	RB	NA	OPS 7350 MEWS 11//SDC 12339	.1	.0001	6.564267	1.013442
12376	1981	031A	SOV	PL	NA	COSMOS 1261	67.9	.6154	4.162059	2.007147
12383	1981	030D	SOV	RB	NA	MOLNIYA 3-15//SDC 12368	65.0	.7070	4.221192	1.965147
12384	1981	031D	SOV	RB	NA	COSMOS 1261//SDC 12376	67.8	.6077	4.123651	2.035254
12445	1980	098B	USA	RB	NA	INTELSAT VF-2//SDC 12089	23.8	.4670	1.964542	6.192570
12447	1980	081F	SOV	RB	NA	RADUGA 7//SDC 12003	8.1	.0004	6.624317	.999703

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12471	1980	104E	SOV	RB	NA	EKRAN 6//SDC 12120//WAS 96117	7.8	.0037	6.564230	1.013452
12474	1981	050A	ITS	PL	AC	INTELSAT VF-1	2.0	.0003	6.611101	1.002685
12512	1981	054A	SOV	PL	IN	MOLNIYA 3-16	64.0	.6914	4.163742	2.005986
12519	1981	054E	SOV	RB	NA	MOLNIYA 3-16//SDC 12512	64.3	.6873	4.224368	1.962961
12545	1981	057B	IND	PL	NA	APPLE	6.3	.0636	6.400852	1.052511
12546	1981	057C	ESA	DB	NA	TECHNOLOGY CAPSULE FOR 12544	10.4	.7000	3.469175	2.638587
12547	1981	058A	SOV	PL	IN	COSMOS 1278	67.1	.6011	4.165105	2.004997
12556	1981	060A	SOV	PL	IN	MOLNIYA 1-50	64.6	.7343	4.163175	2.006326
12561	1981	058D	SOV	RB	NA	COSMOS 1278//SDC 12547	67.5	.6170	4.187673	1.988804
12562	1981	057D	ESA	RB	NA	METEOSAT 2//SDC 12544	10.5	.5902	2.538886	4.214981
12563	1981	060D	SOV	RB	NA	MOLNIYA 1-50//SDC 12556	64.9	.7301	4.218391	1.967074
12564	1981	061A	SOV	PL	IN	EKRAN 7	7.5	.0003	6.610073	1.002929
12627	1981	071A	SOV	PL	NA	COSMOS 1285	68.0	.6198	4.198788	1.980868
12677	1981	076A	JPN	PL	NA	GMS 2//HIMAWARI 2//MOVED 319	5.7	.0008	6.642737	.995550
12679	1981	070E	USA	RB	NA	DE A//SDC 12624	89.0	.6219	2.873547	3.498237
12680	1981	071D	SOV	RB	NA	COSMOS 1285//SDC 12627	68.0	.6152	4.182400	1.992522
12787	1981	012C	JPN	RB	NA	KIKU 3//SDC 12295	28.6	.7010	3.470236	2.637089
12810	1981	076C	JPN	RB	NA	GMS 2//SDC 12677	28.6	.3813	1.657350	7.991988
12815	1979	077F	SOV	DB	NA	COSMOS 1124//SDC 11509	64.3	.6458	4.128511	2.031681
12817	1979	077H	SOV	DB	NA	COSMOS 1124//SDC 11509	63.4	.6705	4.180975	1.993589
12818	1981	088A	SOV	PL	NA	COSMOS 1305	63.4	.4526	2.135577	5.460665
12827	1981	088B	SOV	RB	NA	COSMOS 1305//SDC 12818	63.4	.4535	2.128496	5.487939
12833	1979	058E	SOV	DB	NA	COSMOS 1109//SDC 11417	67.4	.6586	4.152431	2.014135
12834	1979	058F	SOV	DB	NA	COSMOS 1109//SDC 11417	68.0	.5787	4.167778	2.003030
12850	1981	069F	SOV	RB	NA	RADUGA 9//SDC 12618	7.6	.0024	6.726564	.976984
12851	1981	061F	SOV	RB	NA	EKRAN 7//SDC 12564	7.4	.0002	6.578894	1.010077
12897	1981	102A	SOV	PL	IN	RADUGA 10	7.2	.0006	6.612061	1.002484
12906	1977	068E	SOV	DB	NA	COSMOS 931//SDC 10150	68.2	.5801	4.154967	2.012297
12907	1978	083E	SOV	DB	NA	COSMOS 1030//SDC 11015	64.1	.6361	4.138938	2.024023
12908	1978	016C	USM	DB	NA	FLTSATCOM 1//SDC 10669	26.4	.4426	1.868724	6.674853

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12915	1981	105A	SOV	PL	IN	MOLNIYA 3-1	64.4	.7172	4.147863	2.017457
12919	1978	083F	SOV	DB	NA	COSMOS 1030//SDC 11015	64.6	.6312	4.171604	2.000305
12920	1981	105E	SOV	RB	NA	MOLNIYA 3-17	64.5	.7078	4.222841	1.963987
12933	1981	108A	SOV	PL	NA	COSMOS 1317	67.0	.5952	4.168110	2.002788
12940	1981	108D	SOV	RB	NA	COSMOS 1317//SDC 12933	67.1	.6167	4.184377	1.991124
12959	1981	113A	SOV	PL	IN	MOLNIYA 1-51	64.0	.7022	4.163993	2.005799
12967	1981	114A	USA	PL	AC	RCA SATCOM III OR III-R//SYNC	.1	.0002	6.610797	1.002755
12984	1981	016F	SOV	DB	NA	COSMOS 1247//SDC 12303	67.8	.6013	4.135192	2.026747
12986	1981	113D	SOV	RB	NA	MOLNIYA 1-51//SDC 12959	64.3	.6934	4.090014	2.060459
12993	1981	071E	SOV	DB	NA	COSMOS 1285//SDC 12627	68.1	.6178	4.202086	1.978535
13001	1981	120E	SOV	PL	AC	RADIO 7	83.0	.0020	1.257734	12.080537
13007	1981	119B	USA	RB	NA	INTELSAT VF-3//SDC 12994	23.6	.4659	1.965853	6.186366
13011	1981	122B	ESA	DB	NA	TECH CAP + VIBRATION ISOL DEV	10.8	.7100	3.584479	2.512290
13012	1981	123A	SOV	PL	IN	MOLNIYA 1-52//TT	64.0	.7096	4.163880	2.005823
13016	1981	123D	SOV	RB	NA	MOLNIYA 1-52//SDC 13012	64.2	.6974	4.075956	2.071079
13025	1981	122C	ESA	RB	DD	MARECS A//SDC 13010//21 NOV 1	10.3	.0886	1.119107	14.414567
13035	1982	004A	USA	PL	AC	RCA SATCOM IV	.0	.0002	6.611011	1.002717
13060	1982	009E	SOV	DB	NA	EKRAN 8//SDC 13056	46.7	.5051	2.067507	5.733829
13069	1982	014A	USA	PL	AC	WESTAR IV	.0	.0004	6.610866	1.002753
13070	1982	015A	SOV	PL	IN	MOLNIYA 1-53	63.9	.7227	4.162944	2.006505
13075	1982	015D	SOV	RB	NA	MOLNIYA 1-53//SDC 13070	64.1	.7196	4.214036	1.970137
13080	1982	016A	SOV	PL	IN	COSMOS 1341	67.7	.6100	4.162928	2.006531
13089	1982	019B	USM	RB	NA	OPS 8701 IMEWS 13/SDC 13086	.7	.0012	6.573955	1.011194
13090	1982	016D	SOV	RB	NA	COSMOS 1341//SDC 13080	67.6	.6096	4.129090	2.031253
13091	1964	049F	SOV	DB	NA	COSMOS 41//SDC	71.1	.6719	4.150388	2.015556
13092	1982	020A	SOV	PL	NA	GORIZONT 5	6.9	.0035	6.688544	.985342
13098	1981	114B	USA	RB	NA	RCA/SATCOM 3R (PAM-D)	27.4	.7310	3.831213	2.272835
13112	1982	023D	SOV	DB	NA	MOLNIYA 3-18//SDC 13107	65.0	.7154	4.219604	1.966250
13124	1982	029A	SOV	PL	NA	COSMOS 1348	66.3	.6066	4.168359	2.002602
13137	1982	031B	IND	RB	NA	INSAT 1A R/B (PAM-D)	28.5	.7220	3.683991	2.411778

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13169	1982	029D	SOV	RB	NA	COSMOS 1348//SDC 13124	66.6	.6158	4.115358	2.041422
13177	1982	044A	SOV	PL	IN	COSMOS 1366	6.5	.0007	6.611606	1.002573
13205	1982	045A	SOV	PL	IN	COSMOS 1367	65.4	.6155	4.161064	2.007897
13215	1982	045D	SOV	RB	NA	COSMOS 1367//SDC 13205	65.6	.6279	4.110326	2.045191
13237	1982	050A	SOV	PL	NA	MOLNIYA 1-54	64.8	.7059	4.163304	2.006276
13253	1982	050E	SOV	RB	NA	MOLNIYA 1-54//SDC 13237	65.0	.7020	4.218973	1.966707
13269	1982	058A	USA	PL	AC	WESTAR V	.0	.0002	6.611020	1.002705
13294	1982	058B	USA	RB	DD	WESTAR V//SDC 13269//22 MAR 1	27.0	.0510	1.075291	15.300376
13295	1982	064A	SOV	PL	IN	COSMOS 1382	67.7	.6096	4.165718	2.004511
13298	1982	064D	SOV	RB	NA	COSMOS 1382//SDC 13295	67.6	.6195	4.127253	2.032591
13383	1982	074A	SOV	PL	NA	MOLNIYA 1-55	64.8	.7172	4.163213	2.006326
13390	1982	074D	SOV	RB	NA	MOLNIYA 1-55//SDC 13383	64.8	.7132	4.089145	2.061079
13431	1982	082A	CAN	PL	AC	ANIK D1	.0	.0001	6.610996	1.002712
13432	1982	083A	SOV	PL	IN	MOLNIYA 3-19	64.1	.7092	4.162830	2.006592
13446	1982	083E	SOV	RB	NA	MOLNIYA 3-19//SDC 13432	64.4	.7153	4.222407	1.964264
13447	1982	082C	CAN	RB	NA	ANIK D1 (PAM-D)//SDC 13431	24.4	.7330	3.851909	2.254368
13554	1982	093A	SOV	PL	IN	EKRAN 9	5.7	.0023	6.609907	1.002960
13583	1982	093D	SOV	DB	NA	EKRAN 9 DEBRIS//SDC 13554	49.2	.6067	3.017529	3.251671
13585	1982	095A	SOV	PL	NA	COSMOS 1409	64.7	.6211	4.165949	2.004398
13591	1982	095D	SOV	RB	NA	COSMOS 1409//SDC 13585	65.2	.6353	4.122668	2.036037
13595	1982	097A	ITS	PL	AC	INTELSAT VF-5	.5	.0005	6.611012	1.002712
13603	1982	100A	SOV	PL	NA	COSMOS 1413	64.7	.0003	3.989694	2.138676
13606	1982	100D	SOV	PL	IN	COSMOS 1414	64.7	.0031	3.999207	2.131058
13607	1982	100E	SOV	PL	NA	COSMOS 1415	64.7	.0000	3.990402	2.137989
13608	1982	100F	SOV	DB	NA	COSMOS 1413-1415	52.1	.5630	2.389078	4.615646
13609	1982	100G	SOV	DB	NA	COSMOS 1413-1415	52.1	.5685	2.436253	4.482226
13610	1982	100H	SOV	RB	NA	COSMOS 1413-1415	64.7	.0007	3.987979	2.140066
13624	1982	103A	SOV	PL	NA	GORIZONT 6	6.1	.0013	6.606816	1.003680
13629	1982	103D	SOV	DB	NA	GORIZONT 6 FRAGMENT//SDC 13624	46.8	.7238	3.694801	2.399914
13630	1982	103E	SOV	RB	NA	GORIZONT 6//SDC 13624	6.1	.0023	6.605367	1.004003

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13631	1982	105A	USA	PL	AC	RCA SATCOM V	.1	.0000	6.611096	1.002686
13637	1982	106B	USM	PL	AC	DSCS III//IRON 6451//SYNCTM 0	.1	.0004	6.610798	1.002768
13643	1982	106D	USM	RB	NA	IUS II//DSCS II-III	4.6	.0042	6.650169	.993882
13644	1982	103F	SOV	DB	NA	GORIZONT 6 FRAGMENT//SDC 13624	46.8	.6052	2.568867	4.125612
13651	1982	110B	USA	PL	AC	SBS C//AKA AT2 F2	.1	.0002	6.611063	1.002694
13652	1982	110C	CAN	PL	AC	ANIK C3	.1	.0004	6.610955	1.002739
13658	1982	110D	USA	RB	NA	SBS C//SBS F2//SDC 13651	22.9	.7304	3.870926	2.238499
13666	1982	110E	CAN	RB	NA	ANIK C3//SDC 13652	22.7	.7306	3.867618	2.241377
13669	1982	113A	SOV	PL	IN	RADUGA 11	5.5	.0047	6.726116	.977085
13676	1982	113E	SOV	DB	NA	RADUGA 11 FRAGMENT//SDC 13669	46.6	.7004	3.393531	2.726618
13753	1976	023K	USA	DB	NA	LES 8-9//SDC 8746-8747	8.6	.0002	6.564141	1.013484
13782	1983	006A	JPN	PL	AC	CS 2A//SAKURA 2A MOVING FRO	2.6	.0000	6.611113	1.002380
13875	1983	015A	SOV	PL	NA	MOLNIYA 3-20	64.0	.7097	4.160848	2.008033
13878	1983	016A	SOV	PL	IN	EKRAN 10	6.9	.0037	6.851947	.950304
13882	1983	015E	SOV	RB	NA	MOLNIYA 3-20//SDC 13875	64.0	.7056	4.218219	1.967220
13890	1983	019A	SOV	PL	IN	MOLNIYA 1-56	63.7	.6992	4.173638	1.998837
13897	1983	019D	SOV	RB	NA	MOLNIYA 1-56//SDC 13890	63.8	.6959	4.220774	1.965456
13899	1982	020F	SOV	RB	NA	GORIZONT 5//SDC 13092	6.9	.0048	6.683793	.986389
13900	1979	015D	SOV	RB	NA	EKRAN 3//SDC 11273	9.0	.0008	6.564458	1.013398
13901	1983	020A	SOV	PL	NA	ASTRON	79.8	.7092	16.987947	.243381
13905	1967	001Z	USA	DB	NA	INTELSAT IIF-1//SDC 2639	23.6	.4677	1.937389	6.323300
13907	1967	01AB	USA	DB	NA	INTELSAT IIF-2//SDC 2639	24.3	.6123	2.680806	3.884282
13908	1967	01AC	USA	DB	NA	INTELSAT IIF-2//SDC 2639	28.4	.7060	3.556919	2.541279
13909	1967	01AD	USA	DB	NA	INTELSAT IIF-2//SDC 2639	25.6	.6765	3.323449	2.813828
13912	1967	01AG	USA	DB	NA	INTELSAT IIF-2//SDC 2639	26.8	.6422	2.914550	3.426348
13913	1969	064Z	USA	DB	DD	INTELSAT IIIF-5//SDC 4051//06	25.6	.0117	1.033708	16.235988
13914	1969	064#	USA	DB	NA	INTELSAT IIIF-5//SDC 4051//06				
13915	1969	64AB	USA	DB	DD	INTELSAT IIIF-5//SDC 4051//23	26.9	.0097	1.030101	16.319154
13939	1967	01AH	USA	DB	NA	INTELSAT IIF-2//SDC 2639	26.2	.1613	1.219524	12.665648
13940	1967	01AJ	USA	DB	NA	INTELSAT IIF-2//SDC 2639	24.3	.5442	2.275830	4.966209

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13954	1982	113F	SOV	RB	NA	RADUGA 11//SDC 13669	5.7	.0028	6.732491	.975698
13958	1967	01AL	USA	DB	NA	INTELSAT IIF-2//SDC 2639	26.9	.6607	3.101599	3.121065
13960	1979	058J	SOV	DB	NA	COSMOS 1109//SDC 11417	67.1	.6656	4.173199	1.999101
13961	1981	071F	SOV	DB	NA	COSMOS 1285//SDC 12627	64.3	.6596	4.198204	1.981329
13964	1983	025A	SOV	PL	NA	MOLNIYA 1-57//TT	64.1	.7130	4.157697	2.010325
13967	1983	025D	SOV	RB	NA	MOLNIYA 1-57//SDC 13964	64.3	.7002	4.091653	2.059193
13969	1983	026B	USA	PL	AC	TDRS A//STS-6	4.4	.0018	6.623135	.999972
13970	1983	026D	USA	RB	NA	IUS 2//TDRS A//STS-6	2.7	.1850	5.499688	1.321523
13971	1983	026C	USA	RB	NA	IUS 1//TDRS A//STS-6	26.2	.7056	3.550078	2.548685
13974	1983	028A	SOV	PL	IN	RADUGA 12	5.3	.0004	6.610540	1.002837
13979	1983	028D	SOV	DB	NA	RADUGA 12 FRAGMENT//SDC 13974	46.9	.6628	3.014295	3.257041
13980	1983	028E	SOV	DB	NA	RADUGA 12 FRAGMENT//SDC 13974	47.4	.7259	3.844159	2.261466
13984	1983	030A	USA	PL	AC	RCA SATCOM VI OR I-R	.1	.0002	6.610953	1.002739
13990	1983	030C	USA	RB	DD	RCA SATCOM VI//SDC 13984//27	24.1	.6372	2.827561	3.585827
14000	1977	068G	SOV	DB	NA	COSMOS 931//SDC 10150	65.7	.6268	4.166785	2.003732
14005	1979	062D	SOV	RB	NA	GORIZONT 2//SDC 11440	8.8	.0005	6.727741	.976738
14034	1983	038A	SOV	PL	IN	COSMOS 1456	66.8	.6278	4.165452	2.004743
14050	1983	041A	USA	PL	AC	GOES F	2.1	.0003	6.610924	1.002745
14069	1983	041C	USA	RB	NA	GOES F//SDC 14050	.3	.1594	7.419138	.843396
14070	1979	062E	SOV	DB	NA	GORIZONT 2 FRAGMENT//SDC 11440	46.5	.4626	1.905248	6.481507
14077	1983	047A	ITS	PL	AC	INTELSAT VF-6	.2	.0004	6.611039	1.002699
14081	1983	047B	USA	RB	DD	INTELSAT VF-6//SDC 14077//13	22.9	.0299	1.050765	15.842110
14095	1983	051A	ESA	PL	DD	EXOSAT//06 MAY 1986	74.9	.9365	16.320628	.259120
14114	1982	044F	SOV	RB	NA	COSMOS 1366//SDC 13177	9.1	.0127	6.610716	1.002779
14115	1982	093F	SOV	RB	NA	EKRAN 9//SDC 13554	6.5	.0008	6.568056	1.012576
14117	1982	009F	SOV	RB	NA	EKRAN 8//SDC 13056	6.9	.0060	6.579804	1.009858
14130	1983	059C	ESA	RB	NA	ECS 1//OSCAR 10//SDC 14128	8.7	.6428	2.897747	3.456614
14134	1983	059C	INO	PL	AC	PALAPA B1//STS-7	.1	.0001	6.610899	1.002748
14158	1983	065A	USA	PL	AC	GALAXY I	.1	.0001	6.610764	1.002762
14166	1983	066D	SOV	DB	DD	GORIZONT 7//SDC 14160//22 FEB	46.6	.7362	3.856019	2.251050

Sid	Year	Designation	Owner	Mission	Status	Comment	Inclination	Eccentricity	Semi major axis	Mean motion
14168	1983	065C	USA	RB	NA	GALAXY I//SDC 14158	23.1	.6114	2.667348	3.913793
14182	1983	070A	SOV	PL	IN	COSMOS 1481	67.5	.6354	4.122797	2.035895
14190	1983	072B	USM	RB	NA	GPS 7//OPS 1204//SDC 14189	63.7	.5650	2.685356	3.872803
14193	1980	060F	SOV	RB	NA	EKRAN 5//SDC 11890	8.1	.0016	6.553004	1.016065
14194	1981	027F	SOV	RB	NA	RADUGA 8//SDC 12351	8.0	.0019	6.728101	.976659
14195	1981	102F	SOV	RB	NA	RADUGA 10//SDC 12897	7.3	.0014	6.613034	1.002260
14206	1983	073D	SOV	RB	NA	MOLNIYA 1-58//SDC 14199	63.7	.0132	1.028085	16.344911
14258	1983	084A	SOV	PL	IN	COSMOS 1490	64.8	.0017	3.999237	2.131039
14259	1983	084B	SOV	PL	IN	COSMOS 1491	64.7	.0053	3.970319	2.154361
14260	1983	084C	SOV	PL	IN	COSMOS 1492//RUN CASPER	64.8	.0001	4.003541	2.127612
14264	1983	084D	SOV	RB	NA	COSMOS 1490-1492//SDC 14258-1	64.8	.0005	4.001447	2.129274
14277	1983	084G	SOV	DB	NA	COSMOS 1490//SDC 14258	51.9	.5734	2.486381	4.347353
14287	1983	081C	JPN	RB	NA	CS 2B//SDC 14248	28.5	.5047	2.074515	5.706308
14313	1983	090A	SOV	PL	IN	MOLNIYA 3-21	64.5	.7218	4.159469	2.009002
14319	1983	090D	SOV	RB	NA	MOLNIYA 3-21//SDC 14313	64.4	.7277	4.215472	1.969098
14369	1983	098C	USA	RB	DD	GALAXY II//SDC 14365//31 DEC	23.7	.6238	2.734019	3.771445

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The sky survey made by the infrared astronomical satellite (IRAS) in 1983 included observations of artificial earth satellites. The data base (with celestial objects removed) was correlated with the NORAD space catalogue to identify 452 satellites in orbit above the IRAS 900-km altitude. The flux density in three of the four wavelength bands has been analyzed to determine the temperature, emissivity, and absorptivity of the identified resident space objects.

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